JOURNAL OF RESEARCH of the National Bureau of Standards—C. Engineering and Instrumentation
Vol. 68C, No. 4, October–December 1964

Reference Tables for the Platinel II Thermocouple

L. O. Olsen and P. D. Freeze

(May 28, 1964)

A new thermocouple, Platinel II, was developed by Engelhard Industries, Inc., for sustained operation in oxidizing gases at temperatures higher than those possible with Type K thermocouples, yet having a temperature thermal emf relation comparable to them. The need of reference tables for this thermocouple was made evident by the growing acceptance and increased usage of it.

Twenty-seven thermocouples made of 20-, 30-, and 40-mil diameter elements drawn from three separate melts of the positive and negative alloys were calibrated. Three equations for three temperature ranges were found to fit the averaged data of all thermocouples with a maximum deviation of only 9 microvolts. The reference tables presented were computed from these three equations. They give emfs for each degree Celsius from −100 to 1371 °C and for each degree Fahrenheit from −150 to 2500 °F. Usually these tables, when used in conjunction with any typical undamaged Platinel II thermocouple, will provide temperatures which are not in error by more than 3, 5, and 10 °F at 500, 1000, and 2500 °F, respectively. Other tables are of temperatures in both degrees C and degrees F with emf in millivolts as the argument.

Tables of temperature versus emf of the two elements of Platinel II versus Pt 27 and of copper versus the two elements are also presented. A comparison of the thermal emf of Platinel II with that of Chromel-Alumel is shown. The two thermocouples develop identical emfs at 32, 1300, and 2225 °F. Between 1000 and 2500 °F the maximum indicated difference is only 18 °F when the Chromel-Alumel reference table is used.

1. Introduction

Along with the advances in the technologies of combustion and metallurgy have come substantial increases in the temperature of gaseous products emanating from heat engines. The continuing effort to increase thrust and efficiencies of propulsion engines presages even higher temperatures of exhaust gas in the future. As a result of these higher temperatures a need has arisen for thermocouples capable of sustained operation in hot oxidizing gases. In the past and for most applications at present the base-metal type K thermocouples are adequate for the measurement and control of temperatures of gaseous mixtures. However, as temperatures increase, the thermoelectric stability and life expectancy of such thermocouples will not be satisfactory. For instance, they will not last for the usual 1000 hours between jet engine overhauls. Replacement of thermocouples in jet engines is a very costly procedure not only because of thermocouple expense but also because of the very large labor cost. Therefore, any thermocouple system which needs neither repairs nor replacement during the period between major overhauls will result in substantial savings. The same advantages will accrue to other industrial equipment and processes that involve temperatures that are too high for long-time continued use of the conventional thermocouples.

For these reasons Accinno and Schneider [1] [1] and [2] developed Platinel.[2] Two different combinations have been produced and are named Platinel I and Platinel II. The negative element in each of the thermocouples consists of 65 percent gold and 35 percent palladium (Platinel 1503). The positive element in Platinel I is an alloy containing 83 percent palladium, 14 percent platinum and 3 percent gold (Platinel 1786) and that used in Platinel II contains 55 percent palladium, 31 percent platinum and 14 percent gold (Platinel 1813). Zysk [3] reports that because of its superior mechanical fatigue properties Platinel II is the preferred type.

Following the development of the Platinel thermocouple, a considerable amount of work of evaluating its properties was performed at both Engelhard Industries, Inc. [4] and the National Bureau of Standards [5]. The results of these works indicated the Platinel II thermocouple to be considerably more resistant to oxidation than the type K thermocouples over the entire usable range of temperatures. In addition, the thermoelectric stability was found to be quite good. The changes in thermal emf remained within a ±3/4 percent tolerance for 1000 hr of exposure to air at 2200 °F.

---

[1] Figures in brackets indicate the literature references on page 271.
[2] Registered Trademark of Engelhard Industries, Inc. Patent U.S. 3,066,177, November 27, 1962.

On the basis of these promising results it was decided to establish reference tables for this thermocouple so that it can be used more widely and conveniently. It was further decided to fit empirical equations to the calibration data, if possible, in order to avoid the necessity of storing the complete table when making computer calculations.

A description of reference tables for thermocouples and instructions for their use in conjunction with deviation curves are given by Shenker et al. [6]: "The temperature-electromotive-force relationship for a thermocouple in general cannot be expressed by a simple equation. It is convenient, therefore, to have empirical tables giving the temperature-electromotive-force relationship for the various types of commercially available thermocouples. For any thermocouple type, a table is based on calibrations of representative thermocouples at sufficient points to yield a temperature-electromotive-force plot characteristic of the material. These tables, therefore, do not represent the temperature-electromotive-force relationship for a particular thermocouple but rather a mean of a number of thermocouples of that type. The reference tables so derived provide a basis for drawing deviation curves for comparing individual thermocouples with others of their type or with instruments calibrated to read temperature directly. By using the reference tables in conjunction with a deviation curve, greater precision may be obtained by using a given number of calibration points than from the use of the calibration data alone. The deviation curve is constructed by plotting the differences between the calibration data of an individual instrument and the reference table. The points so plotted may then be connected by a continuous curve which may be used for interpolating between calibration points. For example, it is desired to determine the temperature of a furnace from the measured electromotive force of a calibrated thermocouple. The electromotive force developed by the thermocouple, however, does not correspond to that of any of the calibration points. By plotting a difference curve from the calibration data, one may interpolate between the calibration points to find the correction to be added algebraically to the measured electromotive force to yield the reference table value. The reference table may now be referred to and the furnace temperature corresponding to the corrected thermocouple electromotive force determined."

2. Thermocouples

In order for the calibrations obtained in this work to be representative of Platinel II, three lots of each of the positive and negative elements from separate melts were purchased from Englehard Industries, Inc., the proprietors of this thermocouple. The three lots A, B, and C were selected from wires drawn from bars designated by numbers assigned by the maker as follows:

Lot	Bar numbers	
	Alloy 1503	Alloy 1813
A	43250	43249
B	48946	49085
C	50125	31369

Wires of each of the bars were drawn to 20-, 30-, and 40-mil diameters. Three thermocouples of each wire size and lot were made; thus, 27 thermocouples were available for calibration. They were identified by numbers such as 2–B–30, where the first number refers to the number of the thermocouple, the letter to lot, and the last number to wire diameter in mils.

All elements were 48 in. long and prior to calibration were annealed at a temperature of 2400 °F for a period of 90 min. This was accomplished through electric heating with alternating current in clean draft-free air. The reasons for this lengthy anneal at high temperature are discussed in a later section.

3. Apparatus and Experimental Procedure

All thermocouples with the exception of 3–A–40 were calibrated as described above. Thermocouple 3–A–40 was reserved for calibration at temperatures below 32 °F and comparison with other selected samples at these low temperatures. It was calibrated at six temperatures from −148 °F to 77 °F. These measurements were made in a stirred bath of a cryogenic liquid by members of the Temperature Physics Section. The uncertainty of the measurements below 32 °F was reported to be ±0.2 °F. Using thermocouple 3–A–40 as a standard, six other selected thermocouples were compared with it over the same temperature range and with approximately the same uncertainty. Thus, over the range of temperatures from −148 °F to 77 °F the reference tables are the results of the measurements on the seven following thermocouples: 3–A–40, 1–B–30, 2–B–30, 3–B–30, 1–C–20, 1–C–30, and 1–C–40. From 100 °F to 2500 °F the reference tables are determined from the results of calibrations of 26 thermocouples.

The calibrations from 100 °F to 2500 °F were conducted in a Pereny horizontal tube furnace. The tubular heating element was of silicon carbide, 36 in. long with an inside diameter of 3.5 in. Temperature regulation and control were accomplished with a 36 tap transformer, a saturable core reactor, and a Wheelco controller.

To prevent contamination of the thermocouples from the silicon carbide heating element, a high temperature porcelain, closed end, protection tube (36 in. long with an inside diameter of 3 in.) was inserted into the heating element.

Further protection was provided by another closed end tube of Degussit Al 23, a high-purity impervious alumina. It was supported only near the relatively cool open end and its axis coincided with that of the heating element. This tube had an inside diameter of 12 mm and a length of 24 in. Thermal gradients along the axis of this protection tube were found to be quite small near the center of the furnace (i.e. 18 in. from the open end of the furnace tube). A typical temperature traverse along the axis from the end to the center of the tube is shown in figure 1 for a furnace temperature of about 2400 °F where there is a drop in temperature of only 10 °F from the center of the tube to a distance 4 in. from the center.

Three Platinel II thermocouples along with a calibrated 20-mil platinum versus platinum 10 percent rhodium thermocouple used as the standard of comparison were threaded through two pieces of 24-in.-long Degussit Al 23, four-hole tubing. All eight wires were pressed into intimate electrical and thermal contact by flattening a short piece of small platinum tubing over them. This common junction was placed about 1 in. beyond the center of the furnace tube thereby locating the junction and 2 in. of the thermocouples in virtually a gradient free zone as shown in figure 1.

Measurements of the thermal emf of the standard and test thermocouples were made by simultaneous reading of two Leeds & Northrup Type K–3 potentiometers. Measurements of the thermal emf of all test thermocouple elements versus platinum were also made.

Observations were made in increments of about 50 °F from 100 °F to 2300 °F. This was followed by another series of observations made in descending order of 50 °F increments down to 100 °F. Measurements were then made from 2300 °F to 2500 °F and back down to 2300 °F, again at 50 °F intervals. These measurements were made last because of the decreased stability of the thermocouples at these higher temperatures. The maximum deviation from integral multiples of 50 °F was 5 °F while the vast majority did not exceed 2 °F.

The platinum versus platinum 10 percent rhodium thermocouples used as standards of comparison were calibrated before and after the calibration of each group of three Platinel II thermocouples. These calibrations were made with a platinum versus platinum 10 percent rhodium thermocouple which had a primary calibration and was used exclusively for this work. The thermal emfs of the individual elements of Platinel II versus platinum were determined between 0 and 1450 °C at intervals of about 100 °C. Thus, these can be referred to Pt 27, the platinum reference standard, which is maintained at the National Bureau of Standards. The uncertainties of interpolated values are ±0.5 °C up to 1100 °C and ±2 °C at 1450 °C [7]. On the Fahrenheit scale of temperature these correspond to about ±0.8 °F up to 2000 °F and ±3.0 °F at 2500 °F. The maximum change in calibration of any of the standard thermocouples was only about 0.6 °F and occurred at about 900 °F. Most of this change developed during its first use. The inaccuracies of the two potentiometers contribute slightly to the uncertainty in the values of the temperature of the test thermocouples. The maximum error in the measurement of the emf of the platinum versus platinum 10 percent rhodium thermocouple is ±0.2 to ±1.8 μV. The corresponding errors in the measurements of the Platinel II thermocouple are ±0.2 to ±7.5 μV. These errors combine to increase the uncertainty about ±1.1 °F at 2500 °F. Thus, the maximum uncertainty is about ±4 °F at 2500 °F.

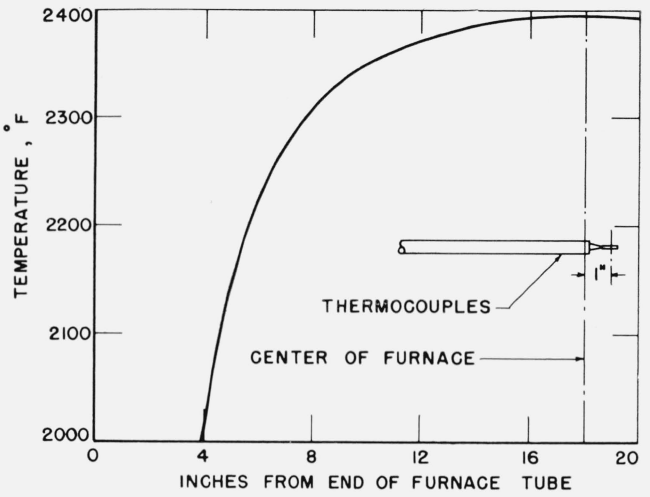

FIGURE 1. *Typical temperature gradient in furnace tube.*

4. Computations

In the temperature range from −148 °F to 77 °F the reference tables are based on the results of seven previously designated thermocouples. One observation on each thermocouple was made at each of six different temperatures within this range of temperatures. The averages of the observations (temperature and emf) on all seven thermocouples at each of these six temperatures were then calculated. From 100 °F to 2500 °F, at 50 °F intervals, the observations on 26 thermocouples in both ascending and descending order of temperature were averaged. Thus, for this range of temperatures, each averaged observation is the result of 52 separate measurements. These data consisting of 55 temperatures and their corresponding emfs are shown in table 1. In the absence of a known functional form for the relation of temperature and emf, a set of three polynomial arcs were used as an approximation to the function. There is some arbitrariness in the selection of the number of intervals and also the width of these intervals. After several trials it was found that equations for three ranges of temperature gave a good fit to the data.

TABLE 1. *Fifty-five averages of observations on Platinel II thermocouples*

Electromotive force in absolute millivolts. Temperature in degrees F*. Reference junctions at 32 °F.

Temperature	Millivolts	Temperature	Millivolts
°F		°F	
−148.0	−2.587	1198.4	26.815
−103.0	−2.008	1248.6	28.053
−58.0	−1.384	1298.4	29.274
−13.0	−0.718	1349.1	30.507
32.0	0.000	1398.1	31.688
77.0	0.768	1448.5	32.887
101.7	1.209	1497.6	34.048
149.0	2.076	1547.8	35.217
200.0	3.054	1599.2	36.396
248.8	4.038	1649.8	37.547
299.1	5.089	1698.4	38.630
349.1	6.169	1747.0	39.712
400.2	7.304	1797.5	40.816
449.9	8.432	1848.5	41.916
498.4	9.547	1898.6	42.986
549.3	10.742	1949.3	44.053
599.5	11.939	1998.2	45.070
649.6	13.154	2049.3	46.113
698.5	14.352	2099.1	47.116
749.1	15.600	2148.7	48.098
799.4	16.840	2199.2	49.082
849.5	18.091	2249.6	50.043
900.2	19.360	2300.0	50.984
948.9	20.580	2350.3	51.906
999.0	21.832	2399.1	52.791
1048.6	23.075	2450.2	53.701
1098.5	24.326	2499.7	54.568
1150.0	25.614		

*Based on the International Practical Temperature Scale of 1948.

An equation of the fourth degree with coefficients computed to give a least square fit to the data from −148 °F to 948.9 °F was found to be

$$\text{Millivolts} = 1.6522713\times10^{-2}t + 1.1041292\times10^{-5}t^2 - 6.0798812\times10^{-9}t^3 + 1.1800871\times10^{-12}t^4$$

where t=(temperature in degrees Fahrenheit)−32°. This equation is used from −150 °F to 873 °F and shows a maximum deviation from the data of 9 μV. From 873 °F to 1178 °F the reference tables are computed from a linear equation derived from the data ranging from 900.2 °F to 1150.0 °F.

$$\text{Millivolts} = -2.3779626 + 2.5037757\times10^{-2}t.$$

In this range the maximum deviation of the data from the reference table is 2 μV. From 1178 °F to 2500 °F the reference table is developed by another equation of the fourth degree with coefficients computed from the data from 1048.6 °F to 2499.7 °F. The maximum deviation is again 9 μV.

$$\text{Millivolts} = -3.5875425 + 2.6136249\times10^{-2}t + 1.1471194\times10^{-6}t^2 - 1.1611900\times10^{-9}t^3 + 1.1112684\times10^{-13}t^4$$

The maximum deviation of 9 μV was considered satisfactorily small; hence, using the three equations the computer was used to calculate emfs for each degree Celsius from −100 to 1371, and for each degree Fahrenheit from −150 to 2500. These values are shown in tables 2A and 4A in the appendix. Tables 1A and 3A, which are emf versus degrees C and emf versus degrees F, were obtained from interpolation at 0.1 mV intervals and the temperatures are reported to the nearest tenth of a degree.

5. Results and Discussion

The principal results of this work are the reference tables, 1A, 2A, 3A, and 4A, which show excellent agreement with the earlier work of Zysk [3]. The maximum difference between these tables and his preliminary tables is only 80 μV. Other information arising from the experiments is of considerable interest and is also presented.

The maximum deviation of the reference tables from the averaged experimental values in table 1 as computed from the equations is 9 μV. A plot of all such deviations is presented in figure 2. While the

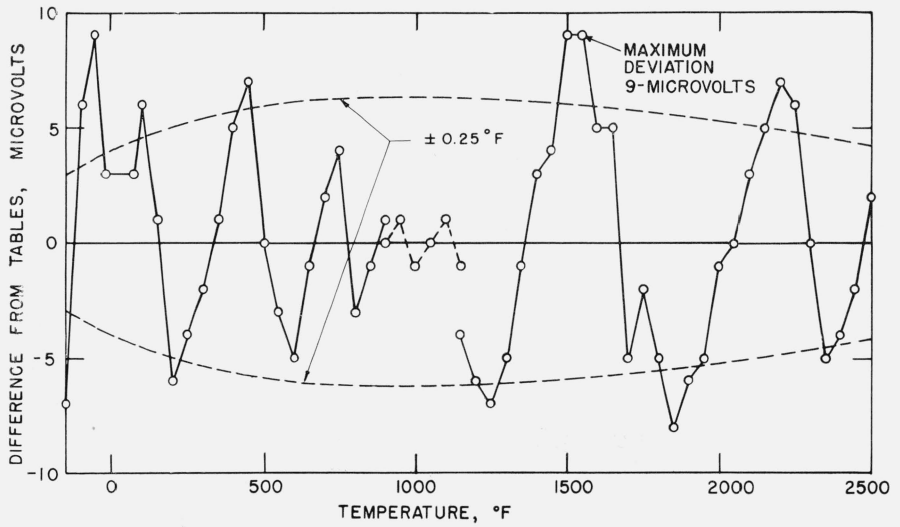

FIGURE 2. *Differences between averaged experimental and reference table values of thermal emf.*

deviations show a definite cyclic pattern, the same pattern was also present in deviations from fifth- and sixth-degree polynomials fit to the same sets of data. The situation is analogous to the mathematical problem of approximating a segment of, say, the exponential or sine curve by a polynomial. It cannot fit the function exactly, but achieves its best fit by undulating about the curve as closely as possible [11]. The reductions in the maximum deviations, going from fourth- to fifth- or sixth-degree polynomials, were small, and the deviations are small as compared to the deviation of individual thermocouples from the reference tables and to the change in emf through exposure to elevated temperatures. In view of these facts, the fourth-degree equations in conjunction with the linear equation were considered to give an adequate representation of the function for the purpose at hand. The deviations are in fact so small they can be ignored and the values in the reference tables as calculated from the three equations need not be adjusted. Thus, a temperature-emf relation with no discontinuities is provided. Such a relation is considered desirable by Benedict and Ashby [8] for computer application. They have "improved" existing tables for base-metal thermocouples with selected values at 50-deg intervals and a second-degree Lagrange interpolation for all values between selected values. If computer programming would be simplified by such interpolation, these data should be amenable to such treatment. However, it seems likely that the three equations will be more convenient in computer programming.

Figure 3 is presented to show the deviations of individual measurements from the values in the reference tables. They are derived from the measurements of all 26 thermocouples in both ascending and descending order. Thus, at each of the six selected temperatures shown, there are 52 individual deviations. The maximum deviation is 116 μV at 2500 °F, which corresponds to about 6.7 °F or 0.26 percent. At 500 °F the maximum deviation is 50 μV, which corresponds to 2.2 °F or 0.43 percent. These values are well within the usual tolerance of $\frac{3}{4}$ percent allowed for base-metal thermocouples. As a matter of fact, nearly all of the thermocouples are within the $\frac{3}{8}$ percent tolerance for selected wires. On the basis of these experiments with 26 thermocouples from three different lots of wire it seems safe to say that the temperature of any Platinel II thermocouple, as determined from the reference tables, will

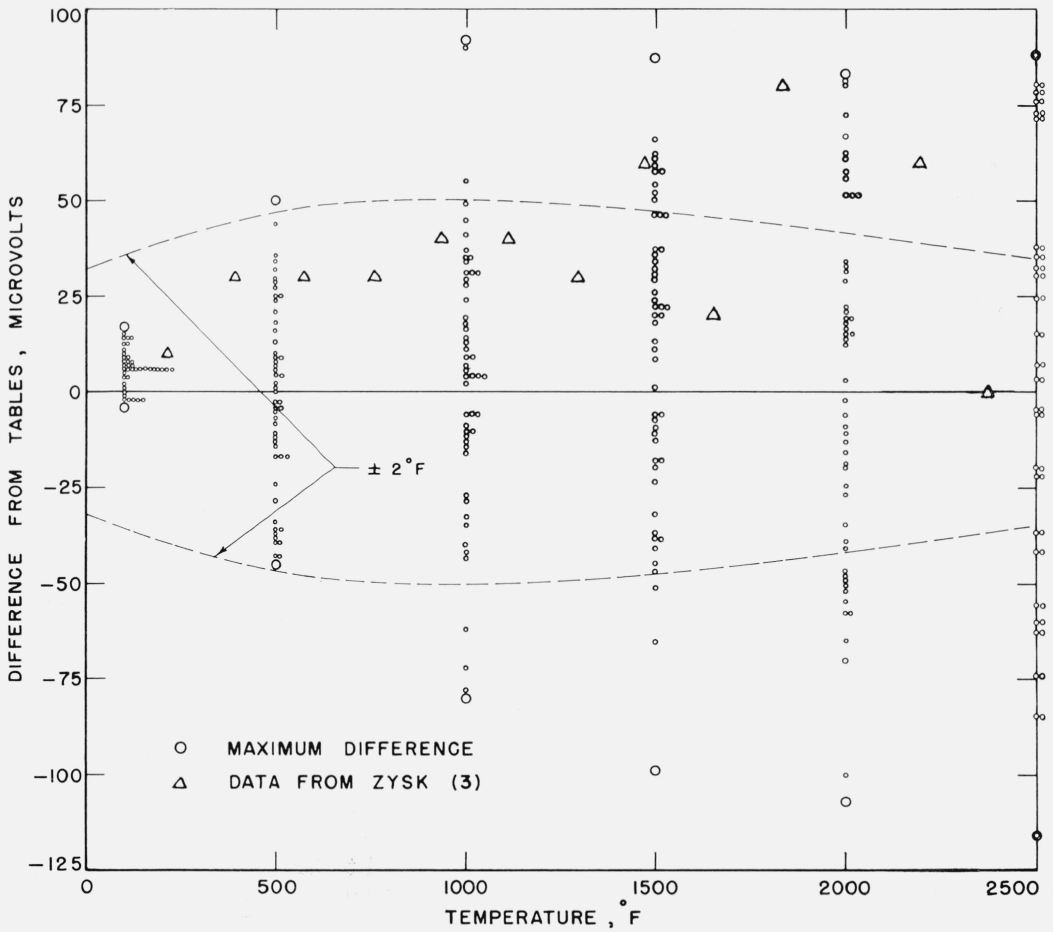

FIGURE 3. *Differences between individual experimental and reference table values of thermal emf.*

be within 0.5 percent of the true temperature. Thus, for most work, a calibration of the thermocouple will not be necessary. It is interesting to note that Zysk's calibration also falls within these limits. The triangular symbols shown on figure 3 are the data from [3].

It was not convenient to indicate individual thermocouples on figure 3 because the large number of thermocouples and observations make such indication extremely difficult; therefore, figure 4 is presented to show the deviation of the output of individual thermocouples from the values in the reference table. These plotted data are for four thermocouples selected at random. They are taken from the average of the observations obtained during both the ascending and decreasing temperature series. From the shapes of these deviation curves it is obvious that for precision thermometry these thermocouples will have to be calibrated at many different temperatures. Not one of the test thermocouples exhibits a linear deviation curve which makes corrections possible with only two calibration points. This is not too surprising since few thermocouples exhibit this desirable characteristic. In this case the lack of linearity is probably due to a shift in calibration during the calibration experiments. In some cases there was considerable change in output between two measurements, one of which was obtained from the increasing and the other from the decreasing temperature series. This change in calibration is shown clearly in figure 5 in which each plotted point is the difference in output between observations obtained at a particular temperature during the increasing and decreasing temperature series. Although this plot is for all of the thermocouples made from the wire of Lot B only it is quite similar to those for Lots A and C. There are two major points of similarity: (1), thermocouples from all three lots experienced the greatest change in output at about 1000 °F; (2) there was a change in sign in the calibration shift of many of the thermocouples in the range of temperatures between 500 and 1000 °F. Upon examination of figure 4 it will be noted that the change in slope of most of the deviation curves also occurs in this same temperature range. It is possible that the change in calibration shown in figure 5 and the change in slope of the deviation curves in figure 4 are the result of some change in one or both of the Platinel alloys. According to a survey by Vines [9] the palladium gold system appears to consist of a continuous series of solid solutions free from transformation in the solid state. However, a peculiar change in the slope of the electrical resistivity and temperature coefficient of electrical resistivity curves in the neighborhood of 70 percent gold has not been explained. This is very close to the composition of the negative element which consists of 65 percent gold and 35 percent palladium.

In some earlier work [5] in which the emf of the individual elements against platinum were measured, the negative element (1503) underwent the greatest change when aged at 2300 °F for 1500 hr. The situation was reversed in the case of the elements aged at 1900 and 2200 °F for 1500 hr. At these aging temperatures the changes in emf of the positive elements (1813) were considerably greater than those of the negative. In this more recent work the emf of the alloy 1813 versus platinum showed the smaller change in emf. In this case the maximum temperature to which the elements were exposed was 2300 °F and for at most only about ½ hr.

There are also a few significant differences in the results of the later tests. The 40-mil thermocouples from Lots B and C suffered the greatest change in emf. From Lot A the 20-mil thermocouples experienced the greatest change while the 40-mil showed very little change. The maximum changes for any thermocouple from Lots A, B, and C were 61, 74, and 92 μV. With changes of this magnitude occurring during calibration the nonlinearity of the deviation curves as shown in figure 4 assumes lesser importance, particularly in the temperature range from 500 to 1000 °F. In this region the maximum change in emf is about the same magnitude as the maximum deviation of the thermocouple emfs from the reference tables; therefore, corrections would be rather difficult to apply.

The long period and high-temperature anneal described in the section entitled Thermocouples was an effort to minimize such changes in the emf during calibration. This procedure was determined from much experience with several thermocouples and a comprehensive set of experiments with one 20-mil thermocouple. Following a determination of its emf at 2300 °F it was heated electrically for ½ hr at 2400 °F. Its emf was again determined at 2300 °F. Emf determinations were repeated following additional heating periods of ½, 1, 1, 3, and 3 hr. The change in microvolts from the original emf is plotted versus the accumulated heating times in figure 6. A large decrease in output after ½ hr of heating is followed by a partial recovery during the next half-hour of heating. Additional heating results in further recovery. Although it is not shown for this thermocouple, prolonged heating will ultimately result in an output greater than the original. It is recognized that 90 min of heating is an inconvenient annealing time; however, this annealing period is considered necessary to eliminate the large emf changes that occur in these thermocouples during the first hour of heating.

The thermal emfs of the two Platinel elements versus the platinum leg of the standard thermocouple were developed from the averages of the observations obtained during the calibrations. Tables 2 and 3, thermal emfs of the elements versus Pt 27, were obtained by adjusting these values to compensate for the difference between Pt 27 and the thermocouple platinum. The thermal emf developed between 1813 and Pt 27 is very low; thus, the emf developed between 1503 and Pt 27 is very nearly equal to that of Platinel II. 1813 is thermoelectrically positive to Pt 27 up to about 1675 °F where it becomes negative. The negative element 1503 is negative to Pt 27 from 32 to 2500 °F. These data in conjunction with a calibration of copper

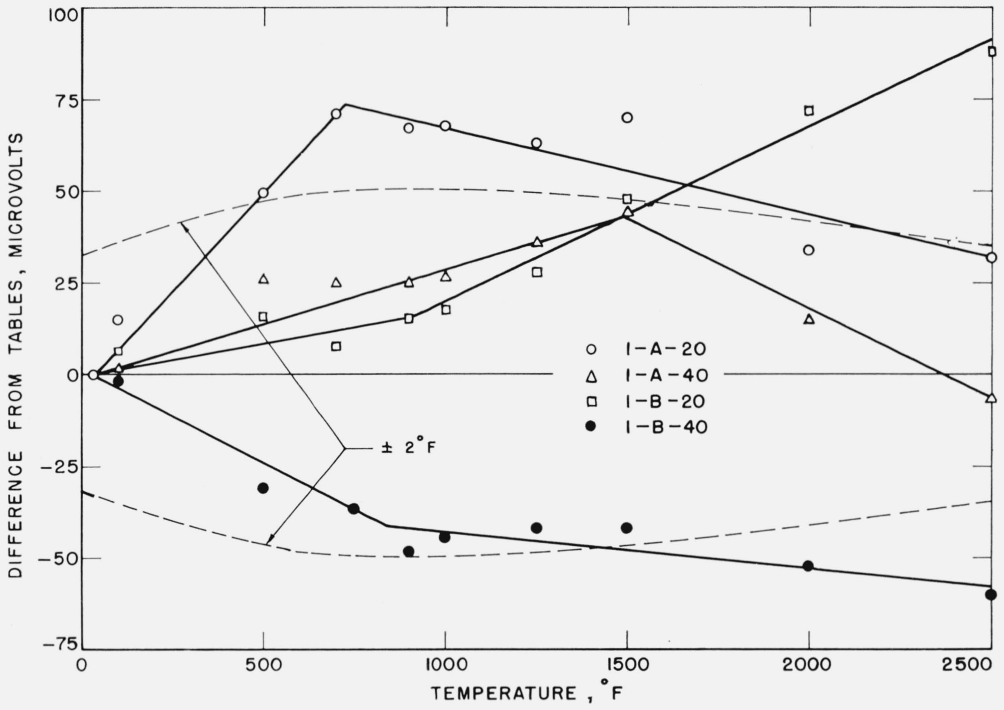

FIGURE 4. *Differences between experimental and reference table values of thermal emf for four thermocouples.*

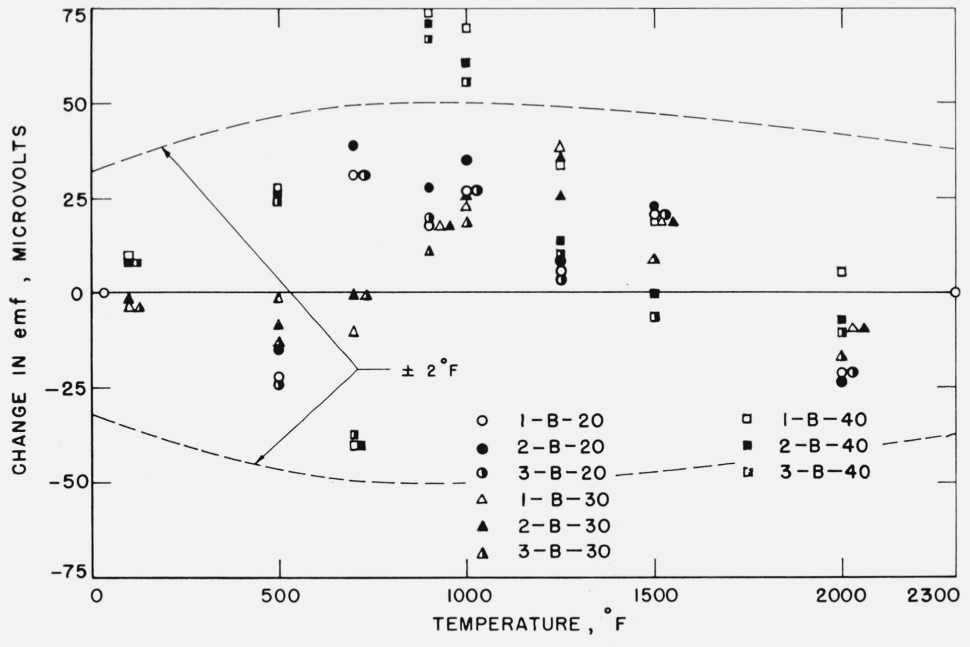

FIGURE 5. *Change in thermal emf between determinations from increasing and decreasing temperature series.*

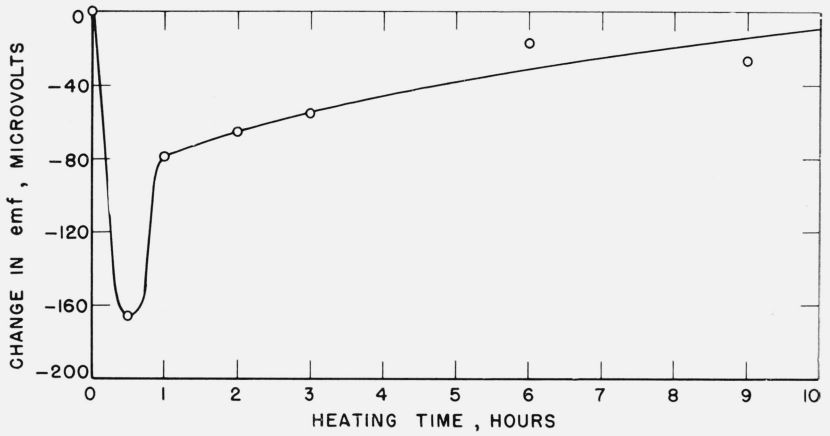

FIGURE 6. *Change in thermal emf at 2300 °F as a function of heating time at 2400 °F.*

TABLE 2. *Thermal emf of 1503 versus Pt 27*

Reference junctions at 32 °F.

Temperature	Millivolts	Temperature	Millivolts
°F		°F	
32	0.000	1400	−31.285
50	−0.300	1450	−32.534
100	−1.163	1500	−33.777
150	−2.064	1550	−35.016
200	−3.001	1600	−36.249
250	−3.971	1650	−37.476
300	−4.974	1700	−38.697
350	−6.005	1750	−39.909
400	−7.063	1800	−41.114
450	−8.147	1850	−42.309
500	−9.253	1900	−43.496
550	−10.380	1950	−44.673
600	−11.526	2000	−45.840
650	−12.689	2050	−46.997
700	−13.869	2100	−48.145
750	−15.063	2150	−49.282
800	−16.269	2200	−50.407
850	−17.488	2250	−51.521
900	−18.718	2300	−52.624
950	−19.956	2350	−53.715
1000	−21.201	2400	−54.794
1050	−22.453	2450	−55.861
1100	−23.711	2500	−56.916
1150	−24.977		
1200	−26.246		
1250	−27.510		
1300	−28.772		
1350	−30.031		

TABLE 3. *Thermal emf of 1813 versus Pt 27*

Reference junctions at 32 °F.

Temperature	Millivolts	Temperature	Millivolts
°F		°F	
32	0.000	1400	.445
50	0.001	1450	.385
100	.010	1500	.318
150	.030	1550	.243
200	.059	1600	.161
250	.095	1650	.071
300	.136	1700	−.026
350	.182	1750	−.129
400	.231	1800	−.238
450	.281	1850	−.353
500	.331	1900	−.474
550	.381	1950	−.600
600	.430	2000	−.732
650	.476	2050	−.870
700	.518	2100	−1.014
750	.556	2150	−1.163
800	.589	2200	−1.317
850	.616	2250	−1.476
900	.637	2300	−1.640
950	.651	2350	−1.809
1000	.658	2400	−1.983
1050	.658	2450	−2.162
1100	.651	2500	−2.345
1150	.637		
1200	.651		
1250	.585		
1300	.546		
1350	.499		

versus Pt 27 furnished the data for the construction of table 5A, which presents the thermal emf of copper versus 1503 and 1813 from 32 to 500° F. These values are often necessary when thermocouple cold junctions are at temperatures other than 32 °F. The values for 1503, 1813, and copper versus Pt 27 are given in 25 °F intervals in table 5A. The copper versus Pt 27 values are in excellent agreement with those of Roeser and Dahl [10] which were reported to the nearest 10 μV. It will be noted that copper is thermoelectrically positive to Pt 27 and to both elements of Platinel II.

One of the aims in the design of Platinel II was to develop a thermocouple having essentially the same thermal-emf relation as Chromel-Alumel.[3] Table 4 shows a comparison of the thermal emf of Platinel II and Chromel-Alumel from NBS Circular 561 over the entire range of calibration in increments of 50 °F. The third column is the difference in degrees F indicated by the two thermocouples if the Chromel-Alumel reference table is used for both. The thermocouples develop identical thermal emfs at 32, 1300, and 2225°F. Between 1000 and 2500 °F the maximum difference between the two thermocouples is only 18 °F.

[3] Registered Trademark of Hoskins Manufacturing Co.

TABLE 4. *Comparison of Platinel II with Chromel-Alumel thermocouple*

Reference junctions at 32 °F.

Temperature	Platinel II	Chromel-Alumel	Difference*
°F	mV	mV	°F
−150	−2.603	−3.52	+53
−100	−1.974	−2.65	+36
−50	−1.277	−1.70	+21
0	−0.517	−0.68	+8
32	0.000	0.00	0
50	0.301	0.40	−4
100	1.173	1.52	−15
150	2.094	2.66	−25
200	3.060	3.82	−33
250	4.066	4.97	−39
300	5.110	6.09	−44
350	6.187	7.20	−46
400	7.294	8.31	−46
450	8.428	9.43	−45
500	9.584	10.57	−44
550	10.761	11.71	−41
600	11.956	12.86	−39
650	13.165	14.02	−37
700	14.387	15.18	−34
750	15.619	16.35	−31
800	16.858	17.53	−28
850	18.104	18.70	−26
900	19.355	19.89	−22
950	20.607	21.07	−20
1000	21.859	22.26	−17
1050	23.110	23.44	−14
1100	24.362	24.63	−11
1150	25.614	25.81	−8
1200	26.861	26.98	−5
1250	28.095	28.15	−2
1300	29.318	29.32	0
1350	30.529	30.49	+2
1400	31.730	31.65	+3
1450	32.919	32.80	+5
1500	34.095	33.93	+7
1550	35.259	35.07	+8
1600	36.410	36.19	+9
1650	37.547	37.31	+10
1700	38.671	38.43	+11
1750	39.780	39.53	+12
1800	40.876	40.62	+12
1850	41.956	41.70	+12
1900	43.022	42.78	+11
1950	44.072	43.85	+10
2000	45.108	44.91	+10
2050	46.127	45.96	+8
2100	47.131	47.00	+6
2150	48.119	48.03	+4
2200	49.090	49.05	+2
2250	50.045	50.06	−1
2300	50.984	51.05	−4
2350	51.906	52.03	−7
2400	52.811	53.01	−10
2450	53.699	53.97	−14
2500	54.571	54.92	−18

*Temperature difference based on Chromel-Alumel table in NBS Circular 561.

6. Conclusions

It should be remembered that the reference tables cited herein were determined from the average values of 27 thermocouples of three wire diameters from three lots each of positive and negative alloys. Although the tables when plotted represent the shape of the temperature-emf curve for Platinel II very well, they cannot be depended upon to provide a calibration curve or temperature-emf relationship for a particular thermocouple. Usually these tables, when used in conjunction with any typical undamaged Platinel II thermocouple, will provide temperatures which are not in error by more than 3, 5, and 10 °F at 500, 1000, and 2500 °F respectively. These errors can be reduced somewhat with deviation curves determined by calibration at several points such as 500, 1000, 1500, and 2500 °F. The maximum error in this case is probably about 6 °F. This can be further reduced if the maximum temperature to which the thermocouple is exposed is reduced below 2300 °F. As shown in [5], thermoelectric stability is greatly improved by a reduction in maximum temperature.

The authors thank Miss J. A. Speckman of the Statistical Engineering Section of the Applied Mathematics Division for her assistance in the determination of the three equations from which these reference tables are developed. They are also indebted to Mrs. M. R. Massie and Mrs. C. S. Watkins, of the Temperature Physics Section, who made all measurements below 25 °C (77 °F).

7. References

[1] D. J. Accinno and J. F. Schneider, Platinel—A noble metal thermocouple to replace Chromel-Alumel, Engelhard Industries, Inc. Tech. Bull. **1,** No. 2, 53 (Sept. 1960).

[2] D. J. Accinno and J. F. Schneider, Platinel: A noble metal thermocouple, Temperature—Its Measurement and Control in Science and Industry **3** (ed., C. M. Herzfeld), Part 2 (ed. A. I. Dahl), p. 195, Reinhold Publ. Corp., New York (1962).

[3] E. D. Zysk, A review of recent work with the Platinel thermocouple, Engelhard Industries, Inc. Tech. Bull. **4,** No. 1, 5 (June 1963).

[4] H. J. Greenberg and E. D. Zysk, Applied research fabrication and testing of 2300 °F thermocouple for air-breathing propulsion systems, WADC Tech. Doc. Rept. ASD–TDR–62–891 (Jan. 1963).

[5] P. D. Freeze and L. O. Olsen, Thermoelectric and mechanical stability of Platinel II thermocouples in oxidizing atmospheres, WADC Tech. Doc. Rept. ASD–TDR–62–835 (Nov. 1962).

[6] H. Shenker, J. I. Lauritzen, R. J. Corruccini, and S. T. Lonberger, Reference tables for thermocouples, NBS Circ. 561, 1 (1955).

[7] W. F. Roeser and S. T. Lonberger, Methods of testing thermocouples and thermocouple materials, NBS Circ. 590 (1958); NBS Handb. 77, **2,** 88 (1961).

[8] R. P. Benedict and H. F. Ashby, Improved reference tables for thermocouples, Temperature—Its Measurement and Control in Science and Industry **3** (ed., C. M. Herzfeld), Part 2 (ed. A. I. Dahl), p. 51, Reinhold Publ. Corp., New York (1962).

[9] R. F. Vines, The platinum metals and their alloys, ed. E. M. Wise, The International Nickel Company, Inc., New York, N.Y. (1941).

[10] W. F. Roeser and A. I. Dahl, Reference tables for iron-constantan and copper-constantan thermocouples, J. Res. NBS **20,** 337 (1938) RP1080.

[11] J. M. Cameron and J. Hilsenrath, Use of general purpose coding systems for statistical calculations, Proc. IBM Scientific Computing Symp. on Statistics held October 21–23, 1963 (In press).

Appendix

Table 1A. Platinel II, millivolts versus degrees Celsius (centigrade)

Electromotive force in absolute millivolts. Temperature in degrees C (Int. 1948). Reference junctions at 0°C.

Millivolts	.000	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	Millivolts
	Degrees C											
-2.000	-74.4	-78.6	-82.9	-87.3	-91.8	-96.3	-100.9	--	--	--	--	-2.000
-1.000	-35.2	-38.9	-42.6	-46.4	-50.3	-54.2	-58.1	-62.1	-66.1	-70.2	-74.4	-1.000
-0.000	0.0	-3.4	-6.8	-10.2	-13.7	-17.2	-20.7	-24.3	-27.9	-31.5	-35.2	-0.000
+0.000	0.0	3.4	6.7	10.0	13.2	16.5	19.7	22.9	26.1	29.3	32.4	+0.000
1.000	32.4	35.5	38.6	41.7	44.8	47.8	50.8	53.9	56.9	59.8	62.8	1.000
2.000	62.8	65.7	68.7	71.6	74.5	77.4	80.3	83.1	86.0	88.8	91.7	2.000
3.000	91.7	94.5	97.3	100.1	102.8	105.6	108.4	111.1	113.9	116.6	119.3	3.000
4.000	119.4	122.0	124.7	127.4	130.1	132.8	135.4	138.1	140.7	143.4	146.0	4.000
5.000	146.0	148.6	151.2	153.8	156.4	159.0	161.6	164.2	166.8	169.3	171.9	5.000
6.000	171.9	174.4	177.0	179.5	182.1	184.6	187.1	189.6	192.1	194.6	197.1	6.000
7.000	197.1	199.6	202.1	204.6	207.1	209.5	212.0	214.5	216.9	219.4	221.9	7.000
8.000	221.9	224.3	226.7	229.1	231.6	234.0	236.4	238.8	241.2	243.6	246.0	8.000
9.000	246.0	248.4	250.8	253.2	255.6	258.0	260.4	262.8	265.1	267.5	269.9	9.000
10.000	269.9	272.2	274.6	276.9	279.3	281.6	284.0	286.3	288.7	291.0	293.4	10.000
11.000	293.4	295.7	298.0	300.4	302.7	305.0	307.3	309.6	312.0	314.3	316.6	11.000
12.000	316.6	318.9	321.2	323.5	325.8	328.1	330.4	332.7	335.0	337.3	339.6	12.000
13.000	339.6	341.8	344.1	346.4	348.7	351.0	353.3	355.5	357.8	360.1	362.3	13.000
14.000	362.3	364.6	366.9	369.1	371.4	373.7	375.9	378.2	380.5	382.7	385.0	14.000
15.000	385.0	387.2	389.5	391.7	394.0	396.2	398.5	400.7	403.0	405.2	407.5	15.000
16.000	407.5	409.7	411.9	414.2	416.4	418.7	420.9	423.1	425.4	427.6	429.8	16.000
17.000	429.8	432.1	434.3	436.5	438.8	441.0	443.2	445.4	447.7	449.9	452.1	17.000
18.000	452.1	454.4	456.6	458.8	461.0	463.2	465.5	468.7	469.9	472.1	474.3	18.000
19.000	474.3	476.6	478.8	481.0	483.2	485.4	487.7	489.9	492.1	494.3	496.5	19.000
20.000	496.5	498.8	501.0	503.2	505.4	507.6	509.9	512.1	514.3	516.5	518.7	20.000
21.000	518.7	520.9	523.2	525.4	527.6	529.8	532.0	534.3	536.5	538.7	540.9	21.000
22.000	540.9	543.1	545.4	547.6	549.8	552.0	554.2	556.4	558.7	560.9	563.1	22.000
23.000	563.1	565.3	567.5	569.8	572.0	574.2	576.4	578.6	580.9	583.1	585.3	23.000
24.000	585.3	587.5	589.7	591.9	594.2	596.4	598.6	600.8	603.0	605.3	607.5	24.000
25.000	607.5	609.7	611.9	614.1	616.4	618.6	620.8	623.0	625.2	627.5	629.7	25.000
26.000	629.7	631.9	634.1	636.3	638.6	640.8	643.0	645.3	647.5	649.8	652.0	26.000
27.000	652.0	654.3	656.5	658.7	661.0	663.2	665.5	667.8	670.0	672.3	674.5	27.000
28.000	674.5	676.8	679.1	681.3	683.6	685.8	688.1	690.4	692.7	694.9	697.2	28.000
29.000	697.2	699.5	701.8	704.0	706.3	708.6	710.9	713.2	715.5	717.8	720.1	29.000
30.000	720.1	722.3	724.6	726.9	729.2	731.5	733.8	736.2	738.5	740.8	743.1	30.000
31.000	743.1	745.4	747.7	750.0	752.3	754.7	757.0	759.3	761.6	764.0	766.3	31.000
32.000	766.3	768.6	770.9	773.3	775.6	778.0	780.3	782.6	785.0	787.3	789.7	32.000
33.000	789.7	792.0	794.4	796.7	799.1	801.5	803.8	806.2	808.6	810.9	813.3	33.000
34.000	813.3	815.7	818.0	820.4	822.8	825.2	827.6	830.0	832.3	834.7	837.1	34.000
35.000	837.1	839.5	841.9	844.3	846.7	849.1	851.5	853.9	856.4	858.8	861.2	35.000
36.000	861.2	863.6	866.0	868.5	870.9	873.3	875.7	878.2	880.6	883.0	885.5	36.000
37.000	885.5	887.9	890.4	892.8	895.3	897.7	900.2	902.7	905.1	907.6	910.0	37.000
38.000	910.0	912.5	915.0	917.5	919.9	922.4	924.9	927.4	929.9	932.4	934.9	38.000
39.000	934.9	937.4	939.9	942.4	944.9	947.4	949.9	952.4	954.9	957.5	960.0	39.000
40.000	960.0	962.5	965.0	967.6	970.1	972.7	975.2	977.7	980.3	982.8	985.4	40.000
41.000	985.4	988.0	990.5	993.1	995.7	998.2	1000.8	1003.4	1006.0	1008.5	1011.1	41.000
42.000	1011.1	1013.7	1016.3	1018.9	1021.5	1024.1	1026.7	1029.3	1032.0	1034.6	1037.2	42.000
43.000	1037.2	1039.8	1042.5	1045.1	1047.7	1050.4	1053.0	1055.7	1058.3	1061.0	1063.6	43.000
44.000	1063.6	1066.3	1069.0	1071.6	1074.3	1077.0	1079.7	1082.3	1085.0	1087.7	1090.4	44.000
45.000	1090.4	1093.1	1095.8	1098.5	1101.3	1104.0	1106.7	1109.4	1112.1	1114.9	1117.6	45.000
46.000	1117.6	1120.4	1123.1	1125.9	1128.6	1131.4	1134.1	1136.9	1139.7	1142.5	1145.2	46.000
47.000	1145.2	1148.0	1150.8	1153.6	1156.4	1159.2	1162.0	1164.8	1167.7	1170.5	1173.3	47.000
48.000	1173.3	1176.1	1179.0	1181.8	1184.7	1187.5	1190.4	1193.2	1196.1	1199.0	1201.9	48.000
49.000	1201.9	1204.7	1207.6	1210.5	1213.4	1216.3	1219.2	1222.1	1225.0	1228.0	1230.9	49.000
50.000	1230.9	1233.8	1236.8	1239.7	1242.7	1245.6	1248.6	1251.6	1254.5	1257.5	1260.5	50.000
51.000	1260.5	1263.5	1266.5	1269.5	1272.5	1275.5	1278.5	1281.5	1284.6	1287.6	1290.6	51.000
52.000	1290.6	1293.7	1296.8	1299.8	1302.9	1306.0	1309.0	1312.1	1315.2	1318.3	1321.4	52.000
53.000	1321.4	1324.5	1327.7	1330.8	1333.9	1337.1	1340.2	1343.4	1346.5	1349.7	1352.9	53.000
54.000	1352.9	1356.0	1359.2	1362.4	1365.6	1368.8	1372.0	--	--	--	--	54.000
Millivolts	.000	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	Millivolts

Table 2A. Platinel II, degrees Celsius versus millivolts

Electromotive force in absolute millivolts. Temperature in degrees C (Int. 1948). Reference junctions at 0°C.

°C	0	1	2	3	4	5	6	7	8	9	10	°C
	Millivolts											
-90	-2.360	-2.383	-2.405	-2.427	-2.449	-2.471	-2.493	-2.515	-2.537	-2.558	-2.580	-90
-80	-2.132	-2.155	-2.178	-2.201	-2.224	-2.247	-2.270	-2.293	-2.315	-2.338	-2.360	-80
-70	-1.894	-1.918	-1.942	-1.966	-1.990	-2.014	-2.038	-2.061	-2.085	-2.108	-2.132	-70
-60	-1.648	-1.673	-1.698	-1.723	-1.747	-1.772	-1.797	-1.821	-1.846	-1.870	-1.894	-60
-50	-1.393	-1.419	-1.445	-1.470	-1.496	-1.522	-1.547	-1.572	-1.598	-1.623	-1.648	-50
-40	-1.130	-1.157	-1.183	-1.210	-1.236	-1.263	-1.289	-1.315	-1.341	-1.367	-1.393	-40
-30	-0.859	-0.887	-0.914	-0.941	-0.968	-0.996	-1.023	-1.050	-1.077	-1.103	-1.130	-30
-20	-0.580	-0.608	-0.637	-0.665	-0.693	-0.721	-0.748	-0.776	-0.804	-0.832	-0.859	-20
-10	-0.294	-0.323	-0.352	-0.381	-0.409	-0.438	-0.467	-0.495	-0.524	-0.552	-0.580	-10
-0	-0.000	-0.030	-0.059	-0.089	-0.118	-0.148	-0.177	-0.206	-0.236	-0.265	-0.294	-0
+0	0.000	0.030	0.060	0.090	0.120	0.150	0.180	0.210	0.240	0.271	0.301	+0
10	0.301	0.331	0.362	0.393	0.423	0.454	0.485	0.516	0.547	0.578	0.609	10
20	0.609	0.640	0.671	0.703	0.734	0.765	0.797	0.828	0.860	0.892	0.923	20
30	0.923	0.955	0.987	1.019	1.051	1.083	1.115	1.148	1.180	1.212	1.245	30
40	1.245	1.277	1.310	1.342	1.375	1.408	1.440	1.473	1.506	1.539	1.572	40
50	1.572	1.605	1.638	1.672	1.705	1.738	1.772	1.805	1.839	1.872	1.906	50
60	1.906	1.939	1.973	2.007	2.041	2.075	2.109	2.143	2.177	2.211	2.245	60
70	2.245	2.280	2.314	2.348	2.383	2.417	2.452	2.486	2.521	2.556	2.591	70
80	2.591	2.625	2.660	2.695	2.730	2.765	2.800	2.836	2.871	2.906	2.941	80
90	2.941	2.977	3.012	3.048	3.083	3.119	3.154	3.190	3.226	3.262	3.298	90
100	3.298	3.334	3.369	3.405	3.442	3.478	3.514	3.550	3.586	3.623	3.659	100
110	3.659	3.695	3.732	3.768	3.805	3.842	3.878	3.915	3.952	3.988	4.025	110
120	4.025	4.062	4.099	4.136	4.173	4.210	4.247	4.285	4.322	4.359	4.397	120
130	4.397	4.434	4.471	4.509	4.546	4.584	4.621	4.659	4.697	4.735	4.772	130
140	4.772	4.810	4.848	4.886	4.924	4.962	5.000	5.038	5.076	5.114	5.153	140
150	5.153	5.191	5.229	5.268	5.306	5.344	5.383	5.421	5.460	5.499	5.537	150
160	5.537	5.576	5.615	5.653	5.692	5.731	5.770	5.809	5.848	5.887	5.926	160
170	5.926	5.965	6.004	6.043	6.083	6.122	6.161	6.200	6.240	6.279	6.319	170
180	6.319	6.358	6.398	6.437	6.477	6.516	6.556	6.596	6.636	6.675	6.715	180
190	6.715	6.755	6.795	6.835	6.875	6.915	6.955	6.995	7.035	7.075	7.115	190
200	7.115	7.155	7.196	7.236	7.276	7.317	7.357	7.397	7.438	7.478	7.519	200
210	7.519	7.559	7.600	7.641	7.681	7.722	7.763	7.803	7.844	7.885	7.926	210
220	7.926	7.967	8.008	8.049	8.090	8.131	8.172	8.213	8.254	8.295	8.336	220
230	8.336	8.377	8.418	8.460	8.501	8.542	8.584	8.625	8.666	8.708	8.749	230
240	8.749	8.791	8.832	8.874	8.915	8.957	8.999	9.040	9.082	9.124	9.165	240
250	9.165	9.207	9.249	9.291	9.333	9.375	9.416	9.458	9.500	9.542	9.584	250
260	9.584	9.626	9.668	9.711	9.753	9.795	9.837	9.879	9.921	9.964	10.006	260
270	10.006	10.048	10.090	10.133	10.175	10.218	10.260	10.302	10.345	10.387	10.430	270
280	10.430	10.472	10.515	10.558	10.600	10.643	10.685	10.728	10.771	10.814	10.856	280
290	10.856	10.899	10.942	10.985	11.027	11.070	11.113	11.156	11.199	11.242	11.285	290
300	11.285	11.328	11.371	11.414	11.457	11.500	11.543	11.586	11.629	11.672	11.716	300
310	11.716	11.759	11.802	11.845	11.888	11.932	11.975	12.018	12.062	12.105	12.148	310
320	12.148	12.192	12.235	12.279	12.322	12.365	12.409	12.452	12.496	12.539	12.583	320
330	12.583	12.626	12.670	12.714	12.757	12.801	12.845	12.888	12.932	12.976	13.019	330
340	13.019	13.063	13.107	13.150	13.194	13.238	13.282	13.326	13.370	13.413	13.457	340
350	13.457	13.501	13.545	13.589	13.633	13.677	13.721	13.765	13.809	13.853	13.897	350
360	13.897	13.941	13.985	14.029	14.073	14.117	14.161	14.205	14.249	14.294	14.338	360
370	14.338	14.382	14.426	14.470	14.514	14.559	14.603	14.647	14.691	14.736	14.780	370
380	14.780	14.824	14.869	14.913	14.957	15.002	15.046	15.090	15.135	15.179	15.223	380
390	15.223	15.268	15.312	15.357	15.401	15.446	15.490	15.535	15.579	15.623	15.668	390
400	15.668	15.713	15.757	15.802	15.846	15.891	15.935	15.980	16.024	16.069	16.114	400
410	16.114	16.158	16.203	16.247	16.292	16.337	16.381	16.426	16.471	16.515	16.560	410
420	16.560	16.605	16.650	16.694	16.739	16.784	16.828	16.873	16.918	16.963	17.008	420
430	17.008	17.052	17.097	17.142	17.187	17.232	17.276	17.321	17.366	17.411	17.456	430
440	17.456	17.501	17.545	17.590	17.635	17.680	17.725	17.770	17.815	17.860	17.904	440
450	17.904	17.949	17.994	18.039	18.084	18.129	18.174	18.219	18.264	18.309	18.354	450
460	18.354	18.399	18.444	18.489	18.534	18.579	18.624	18.669	18.714	18.759	18.804	460
470	18.804	18.849	18.894	18.939	18.984	19.029	19.074	19.119	19.165	19.210	19.255	470
480	19.255	19.300	19.345	19.390	19.435	19.480	19.525	19.570	19.615	19.660	19.705	480
490	19.705	19.750	19.795	19.841	19.886	19.931	19.976	20.021	20.066	20.111	20.156	490
500	20.156	20.201	20.246	20.291	20.336	20.381	20.426	20.471	20.517	20.562	20.607	500
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Table 2A. Platinel II, degrees Celsius versus millivolts - Continued

Electromotive force in absolute millivolts. Temperature in degrees C (Int. 1948). Reference junctions at 0°C.

°C	0	1	2	3	4	5	6	7	8	9	10	°C
	Millivolts											
500	20.156	20.201	20.246	20.291	20.336	20.381	20.426	20.471	20.517	20.562	20.607	500
510	20.607	20.652	20.697	20.742	20.787	20.832	20.877	20.922	20.967	21.012	21.057	510
520	21.057	21.102	21.148	21.193	21.238	21.283	21.328	21.373	21.418	21.463	21.508	520
530	21.508	21.553	21.598	21.643	21.688	21.733	21.778	21.824	21.869	21.914	21.959	530
540	21.959	22.004	22.049	22.094	22.139	22.184	22.229	22.274	22.319	22.364	22.409	540
550	22.409	22.454	22.500	22.545	22.590	22.635	22.680	22.725	22.770	22.815	22.860	550
560	22.860	22.905	22.950	22.995	23.040	23.085	23.131	23.176	23.221	23.266	23.311	560
570	23.311	23.356	23.401	23.446	23.491	23.536	23.581	23.626	23.671	23.716	23.761	570
580	23.761	23.807	23.852	23.897	23.942	23.987	24.032	24.077	24.122	24.167	24.212	580
590	24.212	24.257	24.302	24.347	24.392	24.437	24.483	24.528	24.573	24.618	24.663	590
600	24.663	24.708	24.753	24.798	24.843	24.888	24.933	24.978	25.023	25.068	25.113	600
610	25.113	25.159	25.204	25.249	25.294	25.339	25.384	25.429	25.474	25.519	25.564	610
620	25.564	25.609	25.654	25.699	25.744	25.790	25.835	25.880	25.925	25.970	26.015	620
630	26.015	26.060	26.105	26.150	26.195	26.240	26.285	26.330	26.375	26.420	26.464	630
640	26.464	26.509	26.554	26.598	26.643	26.688	26.732	26.777	26.821	26.866	26.911	640
650	26.911	26.955	27.000	27.044	27.089	27.133	27.178	27.222	27.267	27.311	27.356	650
660	27.356	27.400	27.445	27.489	27.533	27.578	27.622	27.666	27.711	27.755	27.799	660
670	27.799	27.844	27.888	27.932	27.977	28.021	28.065	28.109	28.154	28.198	28.242	670
680	28.242	28.286	28.330	28.374	28.418	28.463	28.507	28.551	28.595	28.639	28.683	680
690	28.683	28.727	28.771	28.815	28.859	28.903	28.947	28.991	29.035	29.079	29.123	690
700	29.123	29.166	29.210	29.254	29.298	29.342	29.386	29.429	29.473	29.517	29.561	700
710	29.561	29.605	29.648	29.692	29.736	29.779	29.823	29.867	29.910	29.954	29.998	710
720	29.998	30.041	30.085	30.128	30.172	30.215	30.259	30.302	30.346	30.389	30.433	720
730	30.433	30.476	30.520	30.563	30.607	30.650	30.693	30.737	30.780	30.823	30.867	730
740	30.867	30.910	30.953	30.997	31.040	31.083	31.126	31.170	31.213	31.256	31.299	740
750	31.299	31.342	31.385	31.429	31.472	31.515	31.558	31.601	31.644	31.687	31.730	750
760	31.730	31.773	31.816	31.859	31.902	31.945	31.988	32.031	32.074	32.116	32.159	760
770	32.159	32.202	32.245	32.288	32.331	32.373	32.416	32.459	32.502	32.544	32.587	770
780	32.587	32.630	32.672	32.715	32.758	32.800	32.843	32.886	32.928	32.971	33.013	780
790	33.013	33.056	33.098	33.141	33.183	33.226	33.268	33.311	33.353	33.395	33.438	790
800	33.438	33.480	33.523	33.565	33.607	33.650	33.692	33.734	33.776	33.819	33.861	800
810	33.861	33.903	33.945	33.987	34.030	34.072	34.114	34.156	34.198	34.240	34.282	810
820	34.282	34.324	34.366	34.408	34.450	34.492	34.534	34.576	34.618	34.660	34.702	820
830	34.702	34.744	34.786	34.827	34.869	34.911	34.953	34.995	35.036	35.078	35.120	830
840	35.120	35.162	35.203	35.245	35.287	35.328	35.370	35.412	35.453	35.495	35.536	840
850	35.536	35.578	35.619	35.661	35.702	35.744	35.785	35.827	35.868	35.910	35.951	850
860	35.951	35.992	36.034	36.075	36.116	36.158	36.199	36.240	36.281	36.323	36.364	860
870	36.364	36.405	36.446	36.487	36.529	36.570	36.611	36.652	36.693	36.734	36.775	870
880	36.775	36.816	36.857	36.898	36.939	36.980	37.021	37.062	37.103	37.144	37.185	880
890	37.185	37.225	37.266	37.307	37.348	37.389	37.429	37.470	37.511	35.552	37.592	890
900	37.592	37.633	37.674	37.714	37.755	37.795	37.836	37.877	37.917	37.958	37.998	900
910	37.998	38.039	38.079	38.120	38.160	38.200	38.241	38.281	38.322	38.362	38.402	910
920	38.402	38.443	38.483	38.523	38.563	38.604	38.644	38.684	38.724	38.764	38.805	920
930	38.805	38.845	38.885	38.925	38.965	39.005	39.045	39.085	39.125	39.165	39.205	930
940	39.205	39.245	39.285	39.325	39.365	39.405	39.444	39.484	39.524	39.564	39.604	940
950	39.604	39.643	39.683	39.723	39.763	39.802	39.842	39.882	39.921	39.961	40.001	950
960	40.001	40.040	40.080	40.119	40.159	40.198	40.238	40.277	40.317	40.356	40.395	960
970	40.395	40.435	40.474	40.514	40.553	40.592	40.631	40.671	40.710	40.749	40.788	970
980	40.788	40.828	40.867	40.906	40.945	40.984	41.023	41.062	41.102	41.141	41.180	980
990	41.180	41.219	41.258	41.297	41.336	41.374	41.413	41.452	41.491	41.530	41.569	990
1000	41.569	41.608	41.646	41.685	41.724	41.763	41.802	41.840	41.879	41.918	41.956	1000
1010	41.956	41.995	42.033	42.072	42.111	42.149	42.188	42.226	42.265	42.303	42.342	1010
1020	42.342	42.380	42.418	42.457	42.495	42.534	42.572	42.610	42.649	42.687	42.725	1020
1030	42.725	42.763	42.801	42.840	42.878	42.916	42.954	42.992	43.030	43.068	43.107	1030
1040	43.107	43.145	43.183	43.221	43.259	43.297	43.334	43.372	43.410	43.448	43.486	1040
1050	43.486	43.524	43.562	43.600	43.637	43.675	43.713	43.751	43.788	43.826	43.864	1050
1060	43.864	43.901	43.939	43.976	44.014	44.052	44.089	44.127	44.164	44.202	44.239	1060
1070	44.239	44.277	44.314	44.351	44.389	44.426	44.464	44.501	44.538	44.575	44.613	1070
1080	44.613	44.650	44.687	44.724	44.762	44.799	44.836	44.873	44.910	44.947	44.984	1080
1090	44.984	45.021	45.058	45.095	45.132	45.169	45.206	45.243	45.280	45.317	45.354	1090
1100	45.354	45.391	45.427	45.464	45.501	45.538	45.574	45.611	45.648	45.685	45.721	1100
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Table 2A. Platinel II, degrees Celsius versus millivolts - Continued

Electromotive force in absolute millivolts. Temperature in degrees C (Int. 1948). Reference junctions at 0°C.

°C	0	1	2	3	4	5	6	7	8	9	10	°C
	Millivolts											
1100	45.354	45.391	45.427	45.464	45.501	45.538	45.574	45.611	45.648	45.685	45.721	1100
1110	45.721	45.758	45.794	45.831	45.868	45.904	45.941	45.977	46.014	46.050	46.087	1110
1120	46.087	46.123	46.160	46.196	46.232	46.269	46.305	46.341	46.378	46.414	46.450	1120
1130	46.450	46.486	46.523	46.559	46.595	46.631	46.667	46.703	46.739	46.775	46.811	1130
1140	46.811	46.847	46.883	46.919	46.955	46.991	47.027	47.063	47.099	47.135	47.171	1140
1150	47.171	47.206	47.242	47.278	47.314	47.350	47.385	47.421	47.457	47.492	47.528	1150
1160	47.528	47.563	47.599	47.635	47.670	47.706	47.741	47.777	47.812	47.848	47.883	1160
1170	47.883	47.918	47.954	47.989	48.024	48.060	48.095	48.130	48.166	48.201	48.236	1170
1180	48.236	48.271	48.306	48.341	48.377	48.412	48.447	48.482	48.517	48.552	48.587	1180
1190	48.587	48.622	48.657	48.692	48.727	48.761	48.796	48.831	48.866	48.901	48.936	1190
1200	48.936	48.970	49.005	49.040	49.075	49.109	49.144	49.179	49.213	49.248	49.282	1200
1210	49.282	49.317	49.351	39.386	49.420	49.455	49.489	49.524	49.558	49.592	49.627	1210
1220	49.627	49.661	49.696	49.730	49.764	49.798	49.833	49.867	49.901	49.935	49.969	1220
1230	49.969	50.003	50.037	50.072	50.106	50.140	50.174	50.208	50.242	50.276	50.310	1230
1240	50.310	50.343	50.377	50.411	50.445	50.479	50.513	50.546	50.580	50.614	50.648	1240
1250	50.648	50.681	50.715	50.749	50.782	50.816	50.850	50.883	50.917	50.950	50.984	1250
1260	50.984	51.017	51.051	51.084	51.117	51.151	51.184	51.218	51.251	51.284	51.318	1260
1270	51.318	51.351	51.384	51.417	51.450	51.484	51.517	51.550	51.583	51.616	51.649	1270
1280	51.649	51.682	51.715	51.748	51.781	51.814	51.847	51.880	51.913	51.946	51.979	1280
1290	51.979	52.012	52.044	52.077	52.110	52.143	52.175	52.208	52.241	52.273	52.306	1290
1300	52.306	52.339	52.371	52.404	52.436	52.469	52.501	52.534	52.566	52.599	52.631	1300
1310	52.631	52.664	52.696	52.728	52.761	52.793	52.825	52.858	52.890	52.922	52.954	1310
1320	52.954	52.986	53.019	53.051	53.083	53.115	53.147	53.179	53.211	53.243	53.275	1320
1330	53.275	53.307	53.339	53.371	53.403	53.435	53.466	53.498	53.530	53.562	53.594	1330
1340	53.594	53.625	53.657	53.689	53.721	53.752	53.784	53.815	53.847	53.879	53.910	1340
1350	53.910	53.942	53.973	54.005	54.036	54.068	54.099	54.130	54.162	54.193	54.224	1350
1360	54.224	54.256	54.287	54.318	54.349	54.381	54.412	54.443	54.474	54.505	54.536	1360
1370	54.536	54.568	--	--	--	--	--	--	--	--	--	1370
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Table 3A. Platinel II, millivolts versus degrees Fahrenheit

Electromotive force in absolute millivolts. Temperature in degrees F.* Reference junctions at 32°F.

Millivolts	.000	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	Millivolts
	Degrees F											
-2.000	-101.9	-109.6	-117.3	-125.2	-133.2	-141.4	-149.7	--	--	--	--	-2.000
-1.000	-31.3	-38.0	-44.7	-51.6	-58.5	-65.5	-72.6	-79.8	-87.0	-94.4	-101.9	-1.000
-0.000	32.0	25.9	19.8	13.6	7.4	1.0	-5.3	-11.7	-18.1	-24.7	-31.3	-0.000
+0.000	32.0	38.0	44.0	49.9	55.8	61.7	67.5	73.3	79.0	84.7	90.3	+0.000
1.000	90.3	95.9	101.5	107.1	112.6	118.1	123.5	128.9	134.3	139.7	145.0	1.000
2.000	145.0	150.3	155.6	160.9	166.1	171.3	176.5	181.7	186.8	191.9	197.0	2.000
3.000	197.0	202.1	207.1	212.1	217.1	222.1	227.1	232.1	237.0	241.9	246.8	3.000
4.000	246.8	251.7	256.6	261.4	266.2	271.0	275.8	280.6	285.3	290.1	294.8	4.000
5.000	294.8	299.5	304.2	308.9	313.6	318.3	322.9	327.6	332.2	336.8	341.4	5.000
6.000	341.4	346.0	350.6	355.2	359.8	364.3	368.8	373.3	377.8	382.3	386.8	6.000
7.000	386.8	391.3	395.8	400.3	404.8	409.2	413.6	418.0	422.4	426.8	431.3	7.000
8.000	431.3	435.7	440.0	444.4	448.8	453.2	457.5	461.9	466.2	470.5	474.9	8.000
9.000	474.9	479.2	483.5	487.8	492.1	496.4	500.7	505.0	509.2	513.5	517.8	9.000
10.000	517.8	522.0	526.3	530.5	534.7	539.0	543.2	547.4	551.6	555.8	560.0	10.000
11.000	560.0	564.2	568.4	572.6	576.8	581.0	585.2	589.4	593.5	597.7	601.8	11.000
12.000	601.8	606.0	610.2	614.3	618.4	622.6	626.7	630.8	635.0	639.1	643.2	12.000
13.000	643.2	647.3	651.4	655.6	659.7	663.8	667.9	672.0	676.0	680.1	684.2	13.000
14.000	684.2	688.3	692.4	696.5	700.5	704.6	708.7	712.8	716.8	720.9	724.9	14.000
15.000	724.9	729.0	733.1	737.1	741.2	745.2	749.3	753.3	757.3	761.4	765.4	15.000
16.000	765.4	769.5	773.5	777.5	781.6	785.6	789.6	793.6	797.7	801.7	805.7	16.000
17.000	805.7	809.7	813.7	817.8	821.8	825.8	829.8	833.8	837.8	841.8	845.8	17.000
18.000	845.8	849.8	853.8	857.8	861.8	865.8	869.8	873.8	877.8	881.8	885.8	18.000
19.000	885.8	889.8	893.8	897.8	901.8	905.8	909.8	913.8	917.8	921.8	925.8	19.000
20.000	925.8	929.8	933.8	937.8	941.7	945.7	949.7	953.7	957.7	961.7	965.7	20.000
21.000	965.7	969.7	973.7	977.7	981.7	985.7	989.7	993.7	997.7	1001.7	1005.6	21.000
22.000	1005.6	1009.6	1013.6	1017.6	1021.6	1025.6	1029.6	1033.6	1037.6	1041.6	1045.6	22.000
23.000	1045.6	1049.6	1053.6	1057.6	1061.6	1065.6	1069.6	1073.5	1077.5	1081.5	1085.5	23.000
24.000	1085.5	1089.5	1093.5	1097.5	1101.5	1105.5	1109.5	1113.5	1117.5	1121.5	1125.5	24.000
25.000	1125.5	1129.5	1133.5	1137.4	1141.4	1145.4	1149.4	1153.4	1157.4	1161.4	1165.4	25.000
26.000	1165.4	1169.4	1173.4	1177.4	1181.4	1185.4	1189.5	1193.5	1197.5	1201.6	1205.6	26.000
27.000	1205.6	1209.7	1213.7	1217.7	1221.8	1225.8	1229.9	1233.9	1238.0	1242.1	1246.2	27.000
28.000	1246.2	1250.2	1254.3	1258.4	1262.4	1266.5	1270.6	1274.7	1278.8	1282.9	1287.0	28.000
29.000	1287.0	1291.1	1295.2	1299.3	1303.4	1307.4	1311.6	1315.7	1319.9	1324.0	1328.1	29.000
30.000	1328.1	1332.4	1336.4	1340.5	1344.6	1348.8	1352.9	1357.1	1361.2	1365.4	1369.5	30.000
31.000	1369.5	1373.7	1377.9	1382.0	1386.2	1390.4	1394.6	1398.7	1402.9	1407.1	1411.3	31.000
32.000	1411.3	1415.5	1419.7	1423.9	1428.1	1432.3	1436.5	1440.8	1445.0	1449.2	1453.4	32.000
33.000	1453.4	1457.7	1461.9	1466.1	1470.4	1474.6	1478.9	1483.1	1487.4	1491.7	1495.9	33.000
34.000	1495.9	1500.2	1504.5	1508.8	1513.0	1517.3	1521.6	1525.9	1530.2	1534.5	1538.8	34.000
35.000	1538.8	1543.1	1547.5	1551.8	1556.1	1560.4	1564.8	1569.1	1573.4	1577.8	1582.1	35.000
36.000	1582.1	1586.5	1590.8	1595.2	1599.6	1604.0	1608.3	1612.7	1617.1	1621.5	1625.9	36.000
37.000	1625.9	1630.3	1634.7	1639.1	1643.5	1647.9	1652.3	1656.8	1661.2	1665.6	1670.1	37.000
38.000	1670.1	1674.5	1679.0	1683.4	1687.9	1692.4	1696.8	1701.3	1705.8	1710.3	1714.8	38.000
39.000	1714.8	1719.3	1723.8	1728.3	1732.8	1737.3	1741.8	1746.4	1750.9	1755.4	1760.0	39.000
40.000	1760.0	1764.5	1769.1	1773.6	1778.2	1782.8	1787.4	1791.9	1796.5	1801.1	1805.7	40.000
41.000	1805.7	1810.3	1814.9	1819.6	1824.2	1828.8	1833.4	1838.1	1842.7	1847.4	1852.0	41.000
42.000	1852.0	1856.7	1861.4	1866.1	1870.7	1875.4	1880.1	1884.8	1889.5	1894.2	1899.0	42.000
43.000	1899.0	1903.7	1908.4	1913.2	1917.9	1922.7	1927.4	1932.2	1937.0	1941.7	1946.5	43.000
44.000	1946.5	1951.3	1956.1	1960.9	1965.7	1970.6	1975.4	1980.2	1985.1	1989.9	1994.8	44.000
45.000	1994.8	1999.6	2004.5	2009.4	2014.3	2019.2	2024.1	2029.0	2033.9	2038.8	2043.7	45.000
46.000	2043.7	2048.7	2053.6	2058.6	2063.5	2068.5	2073.5	2078.4	2083.4	2088.4	2093.4	46.000
47.000	2093.4	2098.5	2103.5	2108.5	2113.5	2118.6	2123.6	2128.7	2133.8	2138.9	2144.0	47.000
48.000	2144.0	2149.1	2154.2	2159.3	2164.4	2169.5	2174.7	2179.8	2185.0	2190.2	2195.3	48.000
49.000	2195.3	2200.5	2205.7	2210.9	2216.1	2221.4	2226.6	2231.8	2237.1	2242.3	2247.6	49.000
50.000	2247.6	2252.9	2258.2	2263.5	2268.8	2274.1	2279.5	2284.8	2290.1	2295.5	2300.9	50.000
51.000	2300.9	2306.2	2311.6	2317.1	2322.5	2327.9	2333.3	2338.8	2344.2	2349.7	2355.2	51.000
52.000	2355.2	2360.7	2366.2	2371.7	2377.2	2382.7	2388.3	2393.8	2399.4	2405.0	2410.6	52.000
53.000	2410.6	2416.2	2421.8	2427.4	2433.0	2438.7	2444.4	2450.0	2455.7	2461.4	2467.1	53.000
54.000	2467.1	2472.9	2478.6	2484.4	2490.1	2495.9	2501.6	--	--	--	--	54.000
Millivolts	.000	.100	.200	.300	.400	.500	.600	.700	.800	.900	1.000	Millivolts

*Based on the International Practical Temperature Scale of 1948.

Table 4A. Platinel II, degrees Fahrenheit versus millivolts

Electromotive force in absolute millivolts. Temperature in degrees F.* Reference junctions at 32°F.

°F	0	1	2	3	4	5	6	7	8	9	10	°F
	Millivolts											
-140	-2.483	-2.495	-2.508	-2.520	-2.532	-2.544	-2.556	-2.568	-2.580	-2.592	-2.603	-140
-130	-2.360	-2.373	-2.385	-2.397	-2.410	-2.422	-2.434	-2.447	-2.459	-2.471	-2.483	-130
-120	-2.234	-2.247	-2.260	-2.272	-2.285	-2.298	-2.310	-2.323	-2.335	-2.348	-2.360	-120
-110	-2.106	-2.119	-2.132	-2.145	-2.158	-2.170	-2.183	-2.196	-2.209	-2.222	-2.234	-110
-100	-1.974	-1.988	-2.001	-2.014	-2.027	-2.040	-2.053	-2.067	-2.080	-2.093	-2.106	-100
-90	-1.840	-1.854	-1.867	-1.881	-1.894	-1.908	-1.921	-1.934	-1.948	-1.961	-1.974	-90
-80	-1.703	-1.717	-1.731	-1.745	-1.758	-1.772	-1.786	-1.799	-1.813	-1.827	-1.840	-80
-70	-1.564	-1.578	-1.592	-1.606	-1.620	-1.634	-1.648	-1.662	-1.676	-1.689	-1.703	-70
-60	-1.422	-1.436	-1.450	-1.465	-1.479	-1.493	-1.507	-1.522	-1.536	-1.550	-1.564	-60
-50	-1.277	-1.292	-1.306	-1.321	-1.335	-1.350	-1.364	-1.379	-1.393	-1.407	-1.422	-50
-40	-1.130	-1.145	-1.160	-1.174	-1.189	-1.204	-1.219	-1.233	-1.248	-1.263	-1.277	-40
-30	-0.980	-0.996	-1.011	-1.026	-1.041	-1.056	-1.071	-1.085	-1.100	-1.115	-1.130	-30
-20	-0.828	-0.844	-0.859	-0.874	-0.890	-0.905	-0.920	-0.935	-0.950	-0.965	-0.980	-20
-10	-0.674	-0.690	-0.705	-0.721	-0.736	-0.752	-0.767	-0.782	-0.798	-0.813	-0.828	-10
-0	-0.517	-0.533	-0.549	-0.565	-0.580	-0.596	-0.612	-0.627	-0.643	-0.658	-0.674	-0
+0	-0.517	-0.501	-0.486	-0.470	-0.454	-0.438	-0.422	-0.406	-0.390	-0.374	-0.358	+0
10	-0.358	-0.342	-0.326	-0.310	-0.294	-0.278	-0.262	-0.245	-0.229	-0.213	-0.197	10
20	-0.197	-0.180	-0.164	-0.148	-0.131	-0.115	-0.099	-0.082	-0.066	-0.049	-0.033	20
30	-0.033	-0.017	0.000	0.017	0.033	0.050	0.066	0.083	0.100	0.116	0.133	30
40	0.133	0.150	0.166	0.183	0.200	0.217	0.233	0.250	0.267	0.284	0.301	40
50	0.301	0.318	0.335	0.352	0.369	0.386	0.403	0.420	0.437	0.454	0.471	50
60	0.471	0.488	0.505	0.523	0.540	0.557	0.574	0.592	0.609	0.626	0.643	60
70	0.643	0.661	0.678	0.696	0.713	0.730	0.748	0.765	0.783	0.800	0.818	70
80	0.818	0.835	0.853	0.871	0.888	0.906	0.923	0.941	0.959	0.977	0.994	80
90	0.994	1.012	1.030	1.048	1.065	1.083	1.101	1.119	1.137	1.155	1.173	90
100	1.173	1.191	1.209	1.227	1.245	1.263	1.281	1.299	1.317	1.335	1.353	100
110	1.353	1.371	1.389	1.408	1.426	1.444	1.462	1.481	1.499	1.517	1.535	110
120	1.535	1.554	1.572	1.590	1.609	1.627	1.646	1.664	1.683	1.701	1.720	120
130	1.720	1.738	1.757	1.775	1.794	1.812	1.831	1.850	1.868	1.887	1.906	130
140	1.906	1.924	1.943	1.962	1.981	1.999	2.018	2.037	2.056	2.075	2.094	140
150	2.094	2.113	2.131	2.150	2.169	2.188	2.207	2.226	2.245	2.264	2.283	150
160	2.283	2.302	2.322	2.341	2.360	2.379	2.398	2.417	2.436	2.456	2.475	160
170	2.475	2.494	2.513	2.533	2.552	2.571	2.591	2.610	2.629	2.649	2.668	170
180	2.668	2.687	2.707	2.726	2.746	2.765	2.785	2.804	2.824	2.843	2.863	180
190	2.863	2.883	2.902	2.922	2.941	2.961	2.981	3.000	3.020	3.040	3.060	190
200	3.060	3.079	3.099	3.119	3.139	3.158	3.178	3.198	3.218	3.238	3.258	200
210	3.258	3.278	3.298	3.318	3.338	3.357	3.377	3.397	3.417	3.438	3.458	210
220	3.458	3.478	3.498	3.518	3.538	3.558	3.578	3.598	3.619	3.639	3.659	220
230	3.659	3.679	3.699	3.720	3.740	3.760	3.781	3.801	3.821	3.842	3.862	230
240	3.862	3.882	3.903	3.923	3.944	3.964	3.984	4.005	4.025	4.046	4.066	240
250	4.066	4.087	4.107	4.128	4.149	4.169	4.190	4.210	4.231	4.252	4.272	250
260	4.272	4.293	4.314	4.334	4.355	4.376	4.397	4.417	4.438	4.459	4.480	260
270	4.480	4.500	4.521	4.542	4.563	4.584	4.605	4.626	4.647	4.668	4.688	270
280	4.688	4.709	4.730	4.751	4.772	4.793	4.814	4.835	4.856	4.878	4.899	280
290	4.899	4.920	4.941	4.962	4.983	5.004	5.025	5.047	5.068	5.089	5.110	290
300	5.110	5.131	5.153	5.174	5.195	5.216	5.238	5.259	5.280	5.302	5.323	300
310	5.323	5.344	5.366	5.387	5.409	5.430	5.451	5.473	5.494	5.516	5.537	310
320	5.537	5.559	5.580	5.602	5.623	5.645	5.666	5.688	5.709	5.731	5.753	320
330	5.753	5.774	5.796	5.818	5.839	5.861	5.883	5.904	5.926	5.948	5.969	330
340	5.969	5.991	6.013	6.035	6.056	6.078	6.100	6.122	6.144	6.165	6.187	340
350	6.187	6.209	6.231	6.253	6.275	6.297	6.319	6.341	6.363	6.384	6.406	350
360	6.406	6.428	6.450	6.472	6.494	6.516	6.538	6.561	6.583	6.605	6.627	360
370	6.627	6.649	6.671	6.693	6.715	6.737	6.759	6.782	6.804	6.826	6.848	370
380	6.848	6.870	6.893	6.915	6.937	6.959	6.982	7.004	7.026	7.048	7.071	380
390	7.071	7.093	7.115	7.138	7.160	7.182	7.205	7.227	7.249	7.272	7.294	390
400	7.294	7.317	7.339	7.362	7.384	7.406	7.429	7.451	7.474	7.496	7.519	400
°F	0	1	2	3	4	5	6	7	8	9	10	°F

*Based on the International Practical Temperature Scale of 1948.

Table 4A. Platinel II, degrees Fahrenheit versus millivolts - Continued

Electromotive force in absolute millivolts. Temperature in degrees F.* Reference junctions at 32°F.

°F	0	1	2	3	4	5	6	7	8	9	10	°F
	Millivolts											
400	7.294	7.317	7.339	7.362	7.384	7.406	7.429	7.451	7.474	7.496	7.519	400
410	7.519	7.541	7.564	7.587	7.609	7.632	7.654	7.677	7.699	7.722	7.745	410
420	7.745	7.767	7.790	7.813	7.835	7.858	7.881	7.903	7.926	7.949	7.971	420
430	7.971	7.994	8.017	8.040	8.062	8.085	8.108	8.131	8.153	8.176	8.199	430
440	8.199	8.222	8.245	8.268	8.290	8.313	8.336	8.359	8.382	8.405	8.428	440
450	8.428	8.451	8.473	8.496	8.519	8.542	8.565	8.588	8.611	8.634	8.657	450
460	8.657	8.680	8.703	8.726	8.749	8.772	8.795	8.818	8.842	8.865	8.888	460
470	8.888	8.911	8.934	8.957	8.980	9.003	9.026	9.050	9.073	9.096	9.119	470
480	9.119	9.142	9.165	9.189	9.212	9.235	9.258	9.282	9.305	9.328	9.351	480
490	9.351	9.375	9.398	9.421	9.444	9.468	9.491	9.514	9.538	9.561	9.584	490
500	9.584	9.608	9.631	9.654	9.678	9.701	9.725	9.748	9.771	9.795	9.818	500
510	9.818	9.842	9.865	9.889	9.912	9.935	9.959	9.982	10.006	10.029	10.053	510
520	10.053	10.076	10.100	10.123	10.147	10.170	10.194	10.218	10.241	10.265	10.288	520
530	10.288	10.312	10.335	10.359	10.383	10.406	10.430	10.454	10.477	10.501	10.524	530
540	10.524	10.548	10.572	10.595	10.619	10.643	10.666	10.690	10.714	10.738	10.761	540
550	10.761	10.785	10.809	10.833	10.856	10.880	10.904	10.928	10.951	10.975	10.999	550
560	10.999	11.023	11.046	11.070	11.094	11.118	11.142	11.166	11.189	11.213	11.237	560
570	11.237	11.261	11.285	11.309	11.333	11.357	11.380	11.404	11.428	11.452	11.476	570
580	11.476	11.500	11.524	11.548	11.572	11.596	11.620	11.644	11.668	11.692	11.716	580
590	11.716	11.740	11.764	11.788	11.812	11.836	11.860	11.884	11.908	11.932	11.956	590
600	11.956	11.980	12.004	12.028	12.052	12.076	12.100	12.124	12.148	12.172	12.197	600
610	12.197	12.221	12.245	12.269	12.293	12.317	12.341	12.365	12.390	12.414	12.438	610
620	12.438	12.462	12.486	12.510	12.535	12.559	12.583	12.607	12.631	12.656	12.680	620
630	12.680	12.704	12.728	12.752	12.777	12.801	12.825	12.849	12.874	12.898	12.922	630
640	12.922	12.946	12.971	12.995	13.019	13.044	13.068	13.092	13.116	13.141	13.165	640
650	13.165	13.189	13.214	13.238	13.262	13.287	13.311	13.335	13.360	13.384	13.408	650
660	13.408	13.433	13.457	13.482	13.506	13.530	13.555	13.579	13.604	13.628	13.652	660
670	13.652	13.677	13.701	13.726	13.750	13.775	13.799	13.823	13.848	13.872	13.897	670
680	13.897	13.921	13.946	13.970	13.995	14.019	14.044	14.068	14.093	14.117	14.142	680
690	14.142	14.166	14.191	14.215	14.240	14.264	14.289	14.313	14.338	14.362	14.387	690
700	14.387	14.411	14.436	14.460	14.485	14.510	14.534	14.559	14.583	14.608	14.632	700
710	14.632	14.657	14.682	14.706	14.731	14.755	14.780	14.805	14.829	14.854	14.878	710
720	14.878	14.903	14.928	14.952	14.977	15.002	15.026	15.051	15.075	15.100	15.125	720
730	15.125	15.149	15.174	15.199	15.223	15.248	15.273	15.297	15.322	15.347	15.371	730
740	15.371	15.396	15.421	15.446	15.470	15.495	15.520	15.544	15.569	15.594	15.619	740
750	15.619	15.643	15.668	15.693	15.717	15.742	15.767	15.792	15.816	15.841	15.866	750
760	15.866	15.891	15.915	15.940	15.965	15.990	16.014	16.039	16.064	16.089	16.114	760
770	16.114	16.138	16.163	16.188	16.213	16.238	16.262	16.287	16.312	16.337	16.362	770
780	16.362	16.386	16.411	16.436	16.461	16.486	16.510	16.535	16.560	16.585	16.610	780
790	16.610	16.635	16.659	16.684	16.709	16.734	16.759	16.784	16.809	16.833	16.858	790
800	16.858	16.883	16.908	16.933	16.958	16.983	17.008	17.032	17.057	17.082	17.107	800
810	17.107	17.132	17.157	17.182	17.207	17.232	17.256	17.281	17.306	17.331	17.356	810
820	17.356	17.381	17.406	17.431	17.456	17.481	17.506	17.530	17.555	17.580	17.605	820
830	17.605	17.630	17.655	17.680	17.705	17.730	17.755	17.780	17.805	17.830	17.855	830
840	17.855	17.880	17.904	17.929	17.954	17.979	18.004	18.029	18.054	18.079	18.104	840
850	18.104	18.129	18.154	18.179	18.204	18.229	18.254	18.279	18.304	18.329	18.354	850
860	18.354	18.379	18.404	18.429	18.454	18.479	18.504	18.529	18.554	18.579	18.604	860
870	18.604	18.629	18.654	18.679	18.704	18.729	18.754	18.779	18.804	18.829	18.854	870
880	18.854	18.879	18.904	18.929	18.954	18.979	19.004	19.029	19.054	19.079	19.104	880
890	19.104	19.129	19.155	19.180	19.205	19.230	19.255	19.280	19.305	19.330	19.355	890
900	19.355	19.380	19.405	19.430	19.455	19.480	19.505	19.530	19.555	19.580	19.605	900
910	19.605	19.630	19.655	19.680	19.705	19.730	19.755	19.780	19.805	19.831	19.856	910
920	19.856	19.881	19.906	19.931	19.956	19.981	20.006	20.031	20.056	20.081	20.106	920
930	20.106	20.131	20.156	20.181	20.206	20.231	20.256	20.281	20.306	20.331	20.356	930
940	20.356	20.381	20.406	20.431	20.456	20.482	20.507	20.532	20.557	20.582	20.607	940
950	20.607	20.632	20.657	20.682	20.707	20.732	20.757	20.782	20.807	20.832	20.857	950
960	20.857	20.882	20.907	20.932	20.957	20.982	21.007	21.032	21.057	21.082	21.107	960
970	21.107	21.132	21.158	21.183	21.208	21.233	21.258	21.283	21.308	21.333	21.358	970
980	21.358	21.383	21.408	21.433	21.458	21.483	21.508	21.533	21.558	21.583	21.608	980
990	21.608	21.633	21.658	21.683	21.708	21.733	21.758	21.783	21.809	21.834	21.859	990
1000	21.859	21.884	21.909	21.934	21.959	21.984	22.009	22.034	22.059	22.084	22.109	1000
°F	0	1	2	3	4	5	6	7	8	9	10	°F

*Based on the International Practical Temperature Scale of 1948.

Table 4A. Platinel II, degrees Fahrenheit versus millivolts - Continued

Electromotive force in absolute millivolts. Temperature in degrees F.* Reference junctions at 32°F.

°F	0	1	2	3	4	5	6	7	8	9	10	°F
	Millivolts											
1000	21.859	21.884	21.909	21.934	21.959	21.984	22.009	22.034	22.059	22.084	22.109	1000
1010	22.109	22.134	22.159	22.184	22.209	22.234	22.259	22.284	22.309	22.334	22.359	1010
1020	22.359	22.384	22.409	22.434	22.459	22.485	22.510	22.535	22.560	22.585	22.610	1020
1030	22.610	22.635	22.660	22.685	22.710	22.735	22.760	22.785	22.810	22.835	22.860	1030
1040	22.860	22.885	22.910	22.935	22.960	22.985	23.010	23.035	23.060	23.085	23.110	1040
1050	23.110	23.136	23.161	23.186	23.211	23.236	23.261	23.286	23.311	23.336	23.361	1050
1060	23.361	23.386	23.411	23.436	23.461	23.486	23.511	23.536	23.561	23.586	23.611	1060
1070	23.611	23.636	23.661	23.686	23.711	23.736	23.761	23.786	23.812	23.837	23.862	1070
1080	23.862	23.887	23.912	23.937	23.962	23.987	24.012	24.037	24.062	24.087	24.112	1080
1090	24.112	24.137	24.162	24.187	24.212	24.237	24.262	24.287	24.312	24.337	24.362	1090
1100	24.362	24.387	24.412	24.437	24.463	24.488	24.513	24.538	24.563	24.588	24.613	1100
1110	24.613	24.638	24.663	24.688	24.713	24.738	24.763	24.788	24.813	24.838	24.863	1110
1120	24.863	24.888	24.913	24.938	24.963	24.988	25.013	25.038	25.063	25.088	25.113	1120
1130	25.113	25.139	25.164	25.189	25.214	25.239	25.264	25.289	25.314	25.339	25.364	1130
1140	25.364	25.389	25.414	25.439	25.464	25.489	25.514	25.539	25.564	25.589	25.614	1140
1150	25.614	25.639	25.664	25.689	25.714	25.739	25.764	25.790	25.815	25.840	25.865	1150
1160	25.865	25.890	25.915	25.940	25.965	25.990	26.015	26.040	26.065	26.090	26.115	1160
1170	26.115	26.140	26.165	26.190	26.215	26.240	26.265	26.290	26.315	26.340	26.365	1170
1180	26.365	26.390	26.415	26.439	26.464	26.489	26.514	26.539	26.564	26.588	26.613	1180
1190	26.613	26.638	26.663	26.688	26.712	26.737	26.762	26.787	26.812	26.836	26.861	1190
1200	26.861	26.886	26.911	26.935	26.960	26.985	27.010	27.034	27.059	27.084	27.109	1200
1210	27.109	27.133	27.158	27.183	27.207	27.232	27.257	27.282	27.306	27.331	27.356	1210
1220	27.356	27.380	27.405	27.430	27.454	27.479	27.504	27.528	27.553	27.578	27.602	1220
1230	27.602	27.627	27.652	27.676	27.701	27.726	27.750	27.775	27.799	27.824	27.849	1230
1240	27.849	27.873	27.898	27.923	27.947	27.972	27.996	28.021	28.045	28.070	28.095	1240
1250	28.095	28.119	28.144	28.168	28.193	28.217	28.242	28.266	28.291	28.315	28.340	1250
1260	28.340	28.365	28.389	28.414	28.438	28.463	28.487	28.512	28.536	28.561	28.585	1260
1270	28.585	28.610	28.634	28.658	28.683	28.707	28.732	28.756	28.781	28.805	28.830	1270
1280	28.830	28.854	28.878	28.903	28.927	28.952	28.976	29.001	29.025	29.049	29.074	1280
1290	29.074	29.098	29.123	29.147	29.171	29.196	29.220	29.244	29.269	29.293	29.318	1290
1300	29.318	29.342	29.366	29.391	29.415	29.439	29.464	29.488	29.512	29.536	29.561	1300
1310	29.561	29.585	29.609	29.634	29.658	29.682	29.707	29.731	29.755	29.779	29.804	1310
1320	29.804	29.828	29.852	29.876	29.901	29.925	29.949	29.973	29.998	30.022	30.046	1320
1330	30.046	30.070	30.094	30.119	30.143	30.167	30.191	30.215	30.240	30.264	30.288	1330
1340	30.288	30.312	30.336	30.360	30.385	30.409	30.433	30.457	30.481	30.505	30.529	1340
1350	30.529	30.554	30.578	30.602	30.626	30.650	30.674	30.698	30.722	30.746	30.771	1350
1360	30.771	30.795	30.819	30.843	30.867	30.891	30.915	30.939	30.963	30.987	31.011	1360
1370	31.011	31.035	31.059	31.083	31.107	31.131	31.155	31.179	31.203	31.227	31.251	1370
1380	31.251	31.275	31.299	31.323	31.347	31.371	31.395	31.419	31.443	31.467	31.491	1380
1390	31.491	31.515	31.539	31.563	31.587	31.610	31.634	31.658	31.682	31.706	31.730	1390
1400	31.730	31.754	31.778	31.802	31.826	31.849	31.873	31.897	31.921	31.945	31.969	1400
1410	31.969	31.993	32.016	32.040	32.064	32.088	32.112	32.136	32.159	32.183	32.207	1410
1420	32.207	32.231	32.255	32.278	32.302	32.326	32.350	32.373	32.397	32.421	32.445	1420
1430	32.445	32.468	32.492	32.516	32.540	32.563	32.587	32.611	32.635	32.658	32.682	1430
1440	32.682	32.706	32.729	32.753	32.777	32.800	32.824	32.848	32.871	32.895	32.919	1440
1450	32.919	32.942	32.966	32.990	33.013	33.037	33.061	33.084	33.108	33.131	33.155	1450
1460	33.155	33.179	33.202	33.226	33.249	33.273	33.297	33.320	33.344	33.367	33.391	1460
1470	33.391	33.414	33.438	33.461	33.485	33.508	33.532	33.556	33.579	33.603	33.626	1470
1480	33.626	33.650	33.673	33.697	33.720	33.743	33.767	33.790	33.814	33.837	33.861	1480
1490	33.861	33.884	33.908	33.931	33.955	33.978	34.001	34.025	34.048	34.072	34.095	1490
1500	34.095	34.119	34.142	34.165	34.189	34.212	34.235	34.259	34.282	34.306	34.329	1500
1510	34.329	34.352	34.376	34.399	34.422	34.446	34.469	34.492	34.516	34.539	34.562	1510
1520	34.562	34.585	34.609	34.632	34.655	34.679	34.702	34.725	34.748	34.772	34.795	1520
1530	34.795	34.818	34.841	34.865	34.888	34.911	34.934	34.958	34.981	35.004	35.027	1530
1540	35.027	35.050	35.074	35.097	35.120	35.143	35.166	35.189	35.213	35.236	35.259	1540
1550	35.259	35.282	35.305	35.328	35.351	35.375	35.398	35.421	35.444	35.467	35.490	1550
1560	35.490	35.513	35.536	35.559	35.582	35.606	35.629	35.652	35.675	35.698	35.721	1560
1570	35.721	35.744	35.767	35.790	35.813	35.836	35.859	35.882	35.905	35.928	35.951	1570
1580	35.951	35.974	35.997	36.020	36.043	36.066	36.089	36.112	36.135	36.158	36.181	1580
1590	36.181	36.203	36.226	36.249	36.272	36.295	36.318	36.341	36.364	36.387	36.410	1590
1600	36.410	36.433	36.455	36.478	36.501	36.524	36.547	36.570	36.593	36.615	36.638	1600
°F	0	1	2	3	4	5	6	7	8	9	10	°F

*Based on the International Practical Temperature Scale of 1948.

Table 4A. Platinel II, degrees Fahrenheit versus millivolts - Continued

Electromotive force in absolute millivolts. Temperature in degrees F.* Reference junctions at 32°F.

°F	0	1	2	3	4	5	6	7	8	9	10	°F
	Millivolts											
1600	36.410	36.433	36.455	36.478	36.501	36.524	36.547	36.570	36.593	36.615	36.638	1600
1610	36.638	36.661	36.684	36.707	36.729	36.752	36.775	36.798	36.821	36.843	36.866	1610
1620	36.866	36.889	36.912	36.935	36.957	36.980	37.003	37.026	37.048	37.071	37.094	1620
1630	37.094	37.116	37.139	37.162	37.185	37.207	37.230	37.253	37.275	37.298	37.321	1630
1640	37.321	37.343	37.366	37.389	37.411	37.434	37.457	37.479	37.502	37.524	37.547	1640
1650	37.547	37.570	37.592	37.615	37.637	37.660	37.683	37.705	37.728	37.750	37.773	1650
1660	37.773	37.795	37.818	37.841	37.863	37.886	37.908	37.931	37.953	37.976	37.998	1660
1670	37.998	38.021	38.043	38.066	38.088	38.111	38.133	38.156	38.178	38.200	38.223	1670
1680	38.223	38.245	38.268	38.290	38.313	38.335	38.357	38.380	38.402	38.425	38.447	1680
1690	38.447	38.469	38.492	38.514	38.537	38.559	38.581	38.604	38.626	38.648	38.671	1690
1700	38.671	38.693	38.715	38.738	38.760	38.782	38.805	38.827	38.849	38.871	38.894	1700
1710	38.894	38.916	38.938	38.961	38.983	39.005	39.027	39.050	39.072	39.094	39.116	1710
1720	39.116	39.138	39.161	39.183	39.205	39.227	39.249	39.272	39.294	39.316	39.338	1720
1730	39.338	39.360	39.382	39.405	39.427	39.449	39.471	39.493	39.515	39.537	39.560	1730
1740	39.560	39.582	39.604	39.626	39.648	39.670	39.692	39.714	39.736	39.758	39.780	1740
1750	39.780	39.802	39.824	39.846	39.868	39.890	39.912	39.935	39.957	39.979	40.001	1750
1760	40.001	40.022	40.044	40.066	40.088	40.110	40.132	40.154	40.176	40.198	40.220	1760
1770	40.220	40.242	40.264	40.286	40.308	40.330	40.352	40.374	40.395	40.417	40.439	1770
1780	40.439	40.461	40.483	40.505	40.527	40.549	40.570	40.592	40.614	40.636	40.658	1780
1790	40.658	40.679	40.701	40.723	40.745	40.767	40.788	40.810	40.832	40.854	40.876	1790
1800	40.876	40.897	40.919	40.941	40.963	40.984	41.006	41.028	41.049	41.071	41.093	1800
1810	41.093	41.115	41.136	41.158	41.180	41.201	41.223	41.245	41.266	41.288	41.310	1810
1820	41.310	41.331	41.353	41.374	41.396	41.418	41.439	41.461	41.483	41.504	41.526	1820
1830	41.526	41.547	41.569	41.590	41.612	41.634	41.655	41.677	41.698	41.720	41.741	1830
1840	41.741	41.763	41.784	41.806	41.827	41.849	41.870	41.892	41.913	41.935	41.956	1840
1850	41.956	41.978	41.999	42.021	42.042	42.063	42.085	42.106	42.128	42.149	42.171	1850
1860	42.171	42.192	42.213	42.235	42.256	42.277	42.299	42.320	42.342	42.363	42.384	1860
1870	42.384	42.406	42.427	42.448	42.470	42.491	42.512	42.534	42.555	42.576	42.597	1870
1880	42.597	42.619	42.640	42.661	42.683	42.704	42.725	42.746	42.768	42.789	42.810	1880
1890	42.810	42.831	42.852	42.874	42.895	42.916	42.937	42.958	42.980	43.001	43.022	1890
1900	43.022	43.043	43.064	43.085	43.107	43.128	43.149	43.170	43.191	43.212	43.233	1900
1910	43.233	43.254	43.275	43.297	43.318	43.339	43.360	43.381	43.402	43.423	43.444	1910
1920	43.444	43.465	43.486	43.507	43.528	43.549	43.570	43.591	43.612	43.633	43.654	1920
1930	43.654	43.675	43.696	43.717	43.738	43.759	43.780	43.801	43.822	43.843	43.864	1930
1940	43.864	43.885	43.905	43.926	43.947	43.968	43.989	44.010	44.031	44.052	44.072	1940
1950	44.072	44.093	44.114	44.135	44.156	44.177	44.198	44.218	44.239	44.260	44.281	1950
1960	44.281	44.302	44.322	44.343	44.364	44.385	44.405	44.426	44.447	44.468	44.488	1960
1970	44.488	44.509	44.530	44.551	44.571	44.592	44.613	44.633	44.654	44.675	44.695	1970
1980	44.695	44.716	44.737	44.757	44.778	44.799	44.819	44.840	44.861	44.881	44.902	1980
1990	44.902	44.922	44.943	44.964	44.984	45.005	45.025	45.046	45.067	45.087	45.108	1990
2000	45.108	45.128	45.149	45.169	45.190	45.210	45.231	45.251	45.272	45.292	45.313	2000
2010	45.313	45.333	45.354	45.374	45.395	45.415	45.436	45.456	45.476	45.497	45.517	2010
2020	45.517	45.538	45.558	45.579	45.599	45.619	45.640	45.660	45.681	45.701	45.721	2020
2030	45.721	45.742	45.762	45.782	45.803	45.823	45.843	45.864	45.884	45.904	45.925	2030
2040	45.925	45.945	45.965	45.985	46.006	46.026	46.046	46.066	46.087	46.107	46.127	2040
2050	46.127	46.147	46.168	46.188	46.208	46.228	46.248	46.269	46.289	46.309	46.329	2050
2060	46.329	46.349	46.369	46.390	46.410	46.430	46.450	46.470	46.490	46.510	46.531	2060
2070	46.531	46.551	46.571	46.591	46.611	46.631	46.651	46.671	46.691	46.711	46.731	2070
2080	46.731	46.751	46.771	46.791	46.811	46.831	46.851	46.871	46.891	46.911	46.931	2080
2090	46.931	46.951	46.971	46.991	47.011	47.031	47.051	47.071	47.091	47.111	47.131	2090
2100	47.131	47.151	47.171	47.191	47.210	47.230	47.250	47.270	47.290	47.310	47.330	2100
2110	47.330	47.350	47.369	47.389	47.409	47.429	47.449	47.468	47.488	47.508	47.528	2110
2120	47.528	47.548	47.567	47.587	47.607	47.627	47.646	47.666	47.686	47.706	47.725	2120
2130	47.725	47.745	47.765	47.785	47.804	47.824	47.844	47.863	47.883	47.903	47.922	2130
2140	47.922	47.942	47.962	47.981	48.001	48.020	48.040	48.060	48.079	48.099	48.119	2140
2150	48.119	48.138	48.158	48.177	48.197	48.216	48.236	48.255	48.275	48.295	48.314	2150
2160	48.314	48.334	48.353	48.373	48.392	48.412	48.431	48.451	48.470	48.490	48.509	2160
2170	48.509	48.529	48.548	48.567	48.587	48.606	48.626	48.645	48.665	48.684	48.703	2170
2180	48.703	38.723	48.742	48.761	48.781	48.800	48.820	48.839	48.858	48.878	48.897	2180
2190	48.897	48.916	48.936	48.955	48.974	48.994	49.013	49.032	49.051	49.071	49.090	2190
2200	49.090	49.109	49.128	49.148	49.167	49.186	49.205	49.225	49.244	49.263	49.282	2200
°F	0	1	2	3	4	5	6	7	8	9	10	°F

*Based on the International Practical Temperature Scale of 1948.

Table 4A. Platinel II, degrees Fahrenheit versus millivolts - Continued

Electromotive force in absolute millivolts. Temperature in degrees F.* Reference junctions at 32°F.

°F	0	1	2	3	4	5	6	7	8	9	10	°F
	Millivolts											
2200	49.090	49.109	49.128	49.148	49.167	49.186	49.205	49.225	49.244	49.263	49.282	2200
2210	49.282	49.301	49.321	49.340	49.359	49.378	49.397	49.417	49.436	49.455	49.474	2210
2220	49.474	49.493	49.512	49.531	49.550	49.570	49.589	49.608	49.627	49.646	49.665	2220
2230	49.665	49.684	49.703	49.722	49.741	49.760	49.779	49.798	49.817	49.836	49.855	2230
2240	49.855	49.874	49.893	49.912	49.931	49.950	49.969	49.988	50.007	50.026	50.045	2240
2250	50.045	50.064	50.083	50.102	50.121	50.140	50.159	50.177	50.196	50.215	50.234	2250
2260	50.234	50.253	50.272	50.291	50.310	50.328	50.347	50.366	50.385	50.404	50.423	2260
2270	50.423	50.441	50.460	50.479	50.498	50.516	50.535	50.554	50.573	50.591	50.610	2270
2280	50.610	50.629	50.648	50.666	50.685	50.704	50.723	50.741	50.760	50.779	50.797	2280
2290	50.797	50.816	50.835	50.853	50.872	50.891	50.909	50.928	50.946	50.965	50.984	2290
2300	50.984	51.002	51.021	51.039	51.058	51.077	51.095	51.114	51.132	51.151	51.169	2300
2310	51.169	51.188	51.206	51.225	51.244	51.262	51.281	51.299	51.318	51.336	51.354	2310
2320	51.354	51.373	51.391	51.410	51.428	51.447	51.465	51.484	51.502	51.520	51.539	2320
2330	51.539	51.557	51.576	51.594	51.612	51.631	51.649	51.668	51.686	51.704	51.723	2330
2340	51.723	51.741	51.759	51.778	51.796	51.814	51.833	51.851	51.869	51.887	51.906	2340
2350	51.906	51.924	51.942	51.960	51.979	51.997	52.015	52.033	52.052	52.070	52.088	2350
2360	52.088	52.106	52.124	52.143	52.161	52.179	52.197	52.215	52.234	52.252	52.270	2360
2370	52.270	52.288	52.306	52.324	52.342	52.360	52.379	52.397	52.415	52.433	52.451	2370
2380	52.451	52.469	52.487	52.505	52.523	52.541	52.559	52.577	52.595	52.613	52.631	2380
2390	52.631	52.649	52.667	52.685	52.703	52.721	52.739	52.757	52.775	52.793	52.811	2390
2400	52.811	52.829	52.847	52.865	52.883	52.901	52.918	52.936	52.954	52.972	52.990	2400
2410	52.990	53.008	53.026	53.044	53.061	53.079	53.097	53.115	53.133	53.151	53.168	2410
2420	53.168	53.186	53.204	53.222	53.240	53.257	53.275	53.293	53.311	53.328	53.346	2420
2430	53.346	53.364	53.381	53.399	53.417	53.435	53.452	53.470	53.488	53.505	53.523	2430
2440	53.523	53.541	53.558	53.576	53.594	53.611	53.629	53.647	53.664	53.682	53.699	2440
2450	53.699	53.717	53.735	53.752	53.770	53.787	53.805	53.822	53.840	53.858	53.875	2450
2460	53.875	53.893	53.910	53.928	53.945	53.963	53.980	53.998	54.015	54.033	54.050	2460
2470	54.050	54.068	54.085	54.102	54.120	54.137	54.155	54.172	54.190	54.207	54.224	2470
2480	54.224	54.242	54.259	54.277	54.294	54.311	54.329	54.346	54.363	54.381	54.398	2480
2490	54.398	54.415	54.433	54.450	54.467	54.485	54.502	54.519	54.536	54.554	54.571	2490
2500	54.571	--	--	--	--	--	--	--	--	--	--	2500
°F	0	1	2	3	4	5	6	7	8	9	10	°F

*Based on the International Practical Temperature Scale of 1948.

Table 5A. Thermal emf relations between 1813, 1503, Pt 27, and copper

Temperature °F	Platinel II	1813 vs Pt 27	1503 vs Pt 27	Copper vs Pt 27	Copper vs 1813	Copper vs 1503
	Millivolts					
32	0.000	0.000	0.000	0.000	0.000	0.000
50	.301	.001	- .300	.062	.061	.362
75	.730	.004	- .726	.153	.149	.879
100	1.173	.010	-1.163	.250	.240	1.413
125	1.627	.019	-1.608	.354	.335	1.962
150	2.094	.030	-2.064	.464	.434	2.528
175	2.571	.044	-2.527	.580	.536	3.107
200	3.060	.059	-3.001	.703	.644	3.704
225	3.558	.076	-3.482	.831	.755	4.313
250	4.066	.095	-3.971	.966	.871	4.937
275	4.584	.115	-4.469	1.107	.992	5.576
300	5.110	.136	-4.974	1.254	1.118	6.228
325	5.645	.159	-5.486	1.404	1.245	6.890
350	6.187	.182	-6.005	1.560	1.378	7.565
375	6.737	.206	-6.531	1.720	1.514	8.251
400	7.294	.231	-7.063	1.886	1.655	8.949
425	7.858	.256	-7.602	2.055	1.799	9.657
450	8.428	.281	-8.147	2.229	1.948	10.376
475	9.003	.306	-8.697	2.408	2.102	11.105
500	9.584	.331	-9.253	2.591	2.260	11.844

(Paper 68C4–174)